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REQUIREMENTS FOR EXPLOSION-PROOF ELECTRICAL EQUIPMENT IN AIR FORCE HANGARS

Lester A. Eggleston, et al

Southwest Research Institute

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AIR FORCE WEAPONS LABORATORY

Air Force Systems Command

Kirtland Air Force Base

New Mexico

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The objective of this research effort was to determine if current requirements for explosion-proof equipment in USAF hangars are more stringent than necessary, and thereby result in unnecessary expense in meeting such requirements. Experiments and tests conducted, both in actual USAF hangars and in the laboratory, indicated that the vapor explosibility hazard from leaks and fuel spills is lower than generally believed. The results of this study indicate that hazardous zone definitions in existing codes could be relaxed without compromising safety. Vertical profile measurements of fuel spills and fuel leak vapors showed that under normal conditions of ventilation, the atmosphere in the 2-in. level was well below the lower explosive limit (LEL). Even with the extreme condition of volatile fuel spills in quiescent, confined spaces, the LEL level did not rise above 7 inches. It was concluded, therefore, that all portions of hangar spaces more than 12 in. above the floor could be considered as nonhazardous with respect to vapors from aircraft fuel spills and leaks relating to explosion-proof equipment requirements. In view of this, it further concluded that the 18-inch upper boundary in existing National Electric Code (NEC) and the Occupational Safety and Health Act (OSHA) requirements are more than adequate to ensure safety.

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FOREWORD

This report was prepared by the Southwest Research Institute, San Antonio, Texas, under Contract F29601-71-C-0116. The research was performed under Program Element 63723F, Project 683M, Task 2.

Inclusive dates of research were June 1971 through July 1972. The report was submitted 15 June 1973 by the Air Force Weapons Laboratory Project Officer, Mr. Frederick H. Peterson (DEZ).

This technical report has been reviewed and is approved.

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ABBREVIATIONS

AC	alternating current
ASTM	American Society for Testing Materials
atm	atmosphere(s)
avgas	aviation gasoline
Div	Division
LEL	lower explosive limit
ℓ/min	liters per minute
MSA	Mine Safety Appliances
NA	nonapplicable
NEC	National Electrical Code
NFPA	National Fire Protection Association
O.D.	outside diameter
Ref(s)	reference(s)
R.H.	relative humidity
sec	second
UDMH	unsymmetrical dimethyl hydrazine
UEL	upper explosive limit
V	volt
Vol%	percent by volume

SECTION I

INTRODUCTION

Many informed persons have been concerned about existing codes pertaining to the explosivity of aircraft fuel vapors in aircraft hangars and resultant requirements for explosion-proof electrical equipment. No data were available with which engineering judgments could be made of criteria now in force. Accordingly, the Civil Engineering Division of the Air Force Weapons Laboratory was directed early in 1971 to carry out an appropriate investigation of the basic problem. On 16 June 1971, the Air Force Weapons Laboratory negotiated a contract with the Southwest Research Institute to accomplish the required research. The Statement of Work for this specifically required the contractor to prepare and submit recommended revisions of AFM 88-15, if such were deemed necessary.

The decided approach to the problem consisted of both laboratory and field tests. Initially, spill and leakage tests would be conducted on a small scale in a simulated hangar environment. These would provide information on the effects of varying fuels, exposed surface areas, temperature, humidity, barometric pressure, and various typical building design features (such as pressurizing to block vapor flow). Laboratory work was carried out in three phases. In Phase 1, sampling was carried out in a single geometric plane for points 18 inches apart between the vapor source and the wall of the room. Vertical increments were taken at points 4 inches to 16 inches above the floor. In Phase 2, sampling was carried out at the center of the room and at points 2 feet from the walls of each corner at heights of 2, 12, 18, and 48 inches. In addition, three points were monitored at the 96-inch ceiling level. Phase 3 studied vertical profiles of vapor concentration at 2-inch intervals up to 24 inches and at 1/2-inch intervals up to 12 inches. Field work was carried out in USAF hangars at Kelly AFB, Randolph AFB, and Bergstrom AFB. The objective of this work was to secure maximum parking and maximum maintenance occupancy for worst-case conditions with fully fueled aircraft and extended closed door operations. A large-scale JP-4 spill test also was included. Sampling was generally at 2 inches above the floor.

To secure quantitative information on actual vapor concentrations arising from flammable liquid spills or leaks under various conditions, a total of 32 tests was carried out under simulated hangar conditions, together with five tests in operating USAF hangars. A total of 124,122 data points was recorded during 591 hours and 10 minutes of testing. The instrumentation consisted of a Beckman Model 400 Total Hydrocarbon Analyzer and a Honeywell 24-Point Recorder which controlled a bank of three-way solenoid valves in a continually purged and synchronized sampling system. The instrumentation was regularly calibrated against a standard methane-air mixture which had been analyzed using a Perkin-Elmer Gas Chromatrograph. Based on data compiled by the US Bureau of Mines, the average lower explosive limit (LEL) of JP-4 and 115/145 avgas was taken at 1.25 percent by volume (12,500 ppm). This figure was then used in calculating the fuel vapor equivalent of the methane-air standard calibration gas.

SECTION II

DISCUSSION OF THE PROBLEM

An unwritten principle of industrial safety states that if a hazard is known to exist, adequate measures must be taken to avoid loss of life or property because of it. Sound economic practice requires that any protective measures taken must be suited both to the severity of the exposure and to the likelihood of adverse consequences. Whenever data on severity and probability are not available, it is not unusual to assume the worst situation and devise countermeasures accordingly.

This practice can be justified only on the grounds that any and all expenditures for safety are worthwhile a premise which is difficult to defend. Frequently, the costs of protection can far exceed the benefits to be realized, and unless safety requirements are based on sound information, the expense may quickly reach the point of diminishing returns on the investments involved and defeat its own purpose. Appreciable savings can be realized when the costs of the safety measures provided are equated against the hazard probabilities.

The use, handling, and storage of flammable liquids involves an unavoidable hazard potential. Hangars used for parking and maintenance of partially or fully fueled aircraft can regularly contain areas where concentrations of fuel vapors could conceivably build up to the lower explosive limit (LEL). Some aircraft fuel systems have no allowance for thermal expansion. A fueled aircraft moved into a warm hangar will drip fuel at the tank outlets. In such areas, any source of ignition might produce serious consequences. One obvious protective measure is to minimize the ignition probability by using explosion-proof electrical fixtures in zones where vapor concentrations could present a hazard. These are specified in both the National Fire Protection Association (NFPA) Standards for civil aircraft which include the National Electrical Code (NEC) and AFM 88-15 for military hangars. The question thus arises as to which standard is most appropriate If one is just adequate, the other would appear to be either deficient or excessive, depending on which is used as the reference. For both, the fuel volatilities involved are essentially the same.

The NFPA began formulating its aviation standards about 1950 when piston aircraft dominated the scene and gasoline was the principal fuel used. Efforts to ascertain the basis used by the NFPA committee in defining the limits of the hazardous areas have been unsuccessful As far as could be determined, however, no quantitative data on hangar conditions were then available. Harvey Hansberry (Ref 1), current Vice Chairman of the Aviation Committee, states that he is unaware of any published hangar work Three reports (Refs. 2, 3, 4) were found which dealt with the vapor envelope at tank vents during outdoor refueling. But since refueling in hangars is presently prohibited by NFPA Standard No. 407, they were inapplicable except for general information. It can only be assumed that the standards represent subjective judgements on the part of those involved.

High-volatility fuels (gasoline, JP-4, and Jet B) are still in sufficient use to warrant the application of appropriate standards. With low-volatility fuels (Jet A, JP-5, and JP-8), the hazard would be almost nonexistent.

Piston engines require a tailored gasoline fuel, while turbine engine fuel requirements are much less critical. JP-4 and Jet B are kerosene-gasoline blends, while Jet A, JP-5, and JP-8 are straight kerosenes. Since the problem is to determine what constitutes an appropriate standard in terms of the more hazardous fuels, the standard should be based on objective judgements resulting from quantitative measurements.

Both aviation gasoline (avgas) and military turbine fuel (JP-4) have flash points below 0°F. By definition, this is the lowest temperature at which, under controlled conditions, the vapor layer over the fuel reaches the LEL. The flash point is commonly determined by the closed cup method ASTM D-56. Since normal hangar ambient conditions are invariably well above 0°F, it can be assumed safely that at the immediate liquid surface of any fuel spill or leak and at some finite distance above it, an explosive concentration can exist. Whether or not this would constitute a hazard depends upon many interrelated variables such as

(1) the partial pressure of the volatile fuel components;

(2) the volume and surface area of the exposed fuel;

(3) air currents in the vicinity of the spill which may dilute the released fuel vapor; and

(4) the time required for cleanup of spills or effective dissipation of volatile fractions.

From an engineering standpoint, any fuel spill involves a diffusion/evaporation process, and, if all the factors were known, equations could conceivably be written to characterize the phenomena. In actual practice, spills are not predictable in size and nature. Temperatures, irregular surface areas, rates of fuel release, and ventilation conditions vary so widely that about the only practical approach to hazard assessment is measurement of vapor concentrations in some worst-case situations.

All of the fuel vapors involved with the fuels mentioned are essentially butane-pentane-hexane mixtures that are several times heavier than air. It would be normal to expect the highest concentrations of flammable gases to build up at floor level or below it, with gradually decreasing concentrations at higher levels as the fuel vapors diffuse upwards or are diluted by air currents. This philosophy is the basis of the several electrical standards in use today which set various distances above the floor as zones in which explosion-proof equipment is mandatory. Such standards can be evaluated only from data on the horizontal and vertical distributions of fuel vapor and the concentrations reached at various times as the fuel evaporates and as vapors are dissipated by convection and diffusion.

There are a number of possible sources of fuel vapors in hangars. These are evaporation from the exposed surfaces of containers, accidentally spilled fuels, inadvertent losses during maintenance operations, leaks dripping onto the floor, and the displacement of vapors from aircraft tanks during thermal expansion or refueling. Once generated, the vapors could move by gravity flow or wind pressure differentials anywhere within the area of concern. Therefore, the overall protective scheme should be based on actually measured concentrations of vapors under representative conditions and should consider the costs of providing adequate protection against adverse situations. By simulation of drips and spills in a small-scale facility under controlled conditions and tests in actual operating hangars, it should be possible to secure useful data on the magnitude of the hazard exposure.

Protection may take a number of forms, and all may supplement each other. In aircraft hangars, an obvious approach is to establish operating practices which minimize the release of vapors. NFPA Standard No. 407 on aircraft fueling, which requires this to be done out-of-doors, is a step in this direction. This eliminates large-scale indoor vapor venting. The cited references 2, 3, and 4 deal with vapor venting.

The requirements of the two codes of interest are shown for an assumed hangar situation in Figure 1. Article 500 of the NEC, which governs hazardous areas in general, classifies them in three ways:

- Class I flammable vapors in sufficient quantities to produce an explosible mixture
- Class II combustible dusts
- Class III easily ignitable fibers.

It should be noted that while the mere presence of flammable vapors could categorize aircraft hangars as Class I, the vapors must be produced in sufficient quantities to present an appreciable hazard. That is, the degree of exposure factor must be represented. If the hazard is continuous, intermittent, or periodic under normal operating conditions, it is described as Class I, Division 1. On the other hand, if the flammables are normally confined and the presence of vapors is the exception rather than the rule, the area is described as Class I, Division 2, and the electrical requirements are less rigorous.

When explosion-proof equipment is necessary, it must be suited to the specific vapors (or dusts) with respect to the maximum explosion pressures the fixture must be able to withstand and the allowable clearances which control flame stopping effectiveness. This requires a further classification by vapor properties as may be seen from reference to Table 500-2(c) of the NEC, included as Appendix 1 on page 32. Almost all flammable liquids, including petroleum fuels, fall into Class I, Group D (Div. 1 or 2). A few compounds used in aerospace work, especially UDMH, are in Class I, Group C. The presence of Group C liquids in hangars, however, is unlikely, and spills of such liquids in hangars are even less likely.

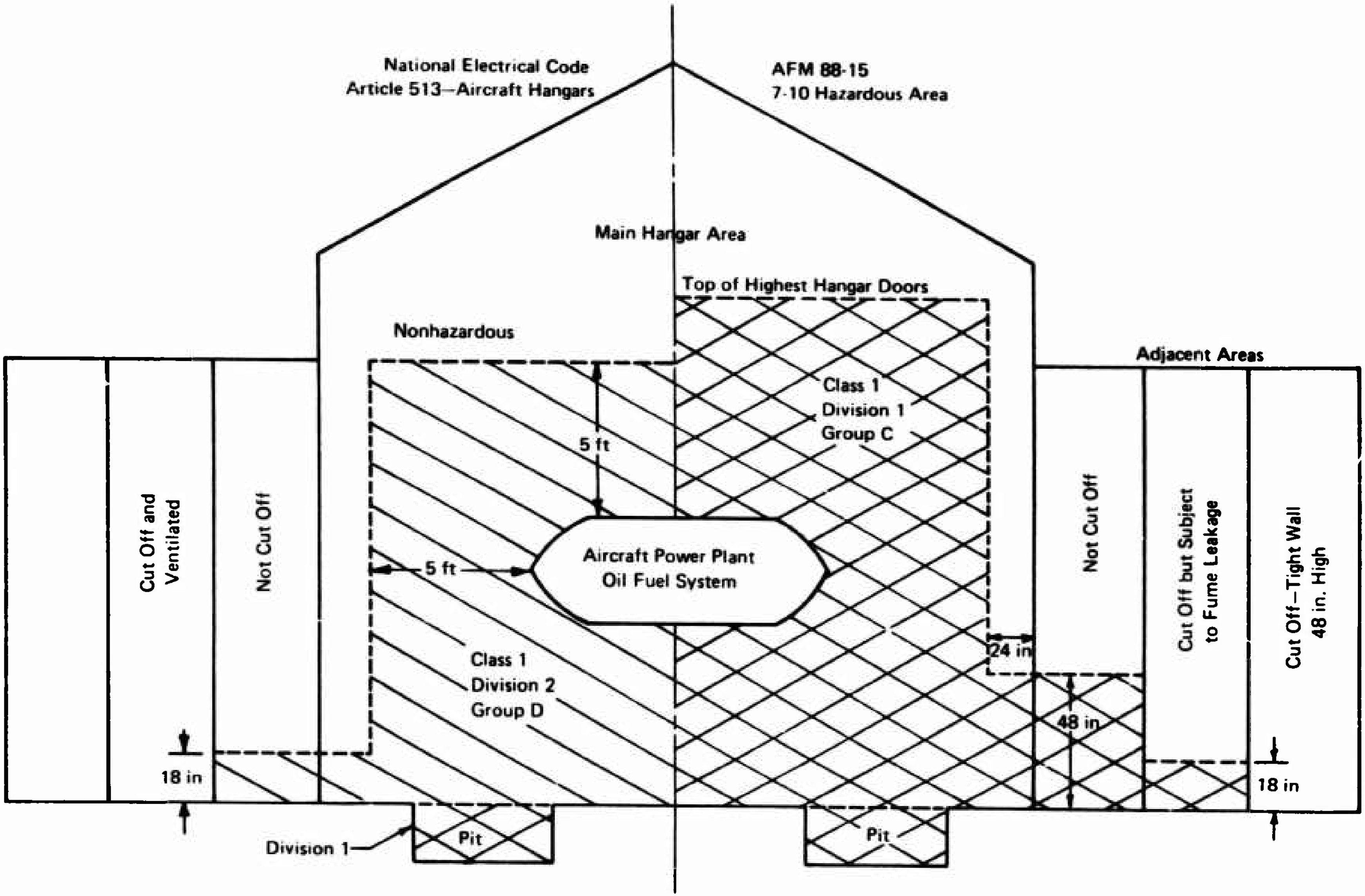

FIGURE 1. COMPARISON OF HAZARDOUS AREA DEFINITIONS BY ARTICLE 513 OF NATIONAL ELECTRICAL CODE AND AFM 88-15

It is very important that any heat-generating equipment selected for use in a hangar not produce a surface temperature high enough to cause auto-ignition of the particular fuel vapor under consideration. The revised National Electric Code states:

(a) Approval for Class and Properties. Equipment shall be approved not only for the class of location but also for the explosion properties of the specific gas, vapor, or dust that will be present. In addition, equipment shall not have exposed any surface that operates at a temperature in excess of the ignition temperature of the specific gas vapor or dust.

The characteristics of various atmospheric mixtures of hazardous gases, vapors, and dusts depend on the specific hazardous material involved.

(b) Marking. Approved equipment shall be marked to show the Class, Group and operating temperature, or temperature range, based on operation in a 40°C ambient for which it is approved.

The temperature range, if provided, shall be indicated in identification numbers, as shown in Table 500-2(b).

Identification numbers marked on equipment nameplates shall be in accordance with Table 500-2(b).

Exception: Equipment of the nonheat-producing type, such as junction boxes, conduit and fittings, are not required to have a marked operating temperature.

For purposes of testing and approval, various atmospheric mixtures (not oxygen enriched) have been grouped on the basis of their hazardous characteristics, and facilities have been made available for testing and approval of equipment for use in the atmospheric groups listed in Table 500-2(c). Since there is no consistent relationship between explosion properties and ignition temperature, the two must be regarded as independent requirements.*

There are appreciable cost differences between the various Group and Division ratings, and between explosion-proof and nonexplosion-proof equipment.

Explosion-proof equipment is more expensive than nonexplosive-proof equipment. For any particular installation wherein operations are well established (in this case, aircraft hangars), it is logical to gather quantitative data on the actual hazard exposure under the most adverse exposure conditions, allow a reasonable margin for any unknowns, and then determine the adequacy of existing safety measures. Accordingly, this research program was designed to provide firm data which could be used by USAF engineers to evaluate the requirements for explosion-proof electrical outlets in USAF aircraft hangars. Pertinent portions of Air Force Manual (AFM) 88-15 and the National Electric Code (NEC) are presented in Appendix I for convenient reference.

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*1971-72 Revised National Electric Code, paragraphs 500-2(a) and (b).

SECTION III

TEST PROGRAM INSTRUMENTATION

1. INSTRUMENT PACKAGE DESIGN

The magnitude of any flammable vapor hazard can be exposed as a percentage of the LEL. If it is below the LEL, the mixture cannot be ignited. A mixture above the LEL must be considered dangerous. Even if the mixture is above the upper explosive limit (UEL), it may become diluted enough to fall within the explosible range.

There are two basic techniques for measuring vapor concentrations. One uses catalytic oxidation of the sample gas by a hot platinum filament to unbalance an electrical bridge circuit and produce a direct readout calibrated in percent of LEL. A portable instrument is available with a hand operated sample pump for quick checking of areas for hazardous gases. Multipoint devices of this design are available with built-in sampling pumps for permanent installation. If desired, special explosion-proof diffusion heads can make the measurement directly at the immediate sampling point. Without special calibration, the latter instruments cannot measure concentrations above the LEL. Common ranges available are 0 to 10 percent and 0 to 100 percent of LEL. Thus, these oxidation type devices were considered to have too limited a range for this program (except for checking purposes) since the range to be investigated was on the order of 0 to 200,000 ppm.

The most versatile instrument for measuring hydrocarbon vapor concentrations is the hydrogen flame ionization meter. This instrument has been available for many years, and its accuracy and stability are well established. Since it was recognized that the vapor concentrations in the test program could vary from extremely low values to well above the LEL and since quantitative results were needed, the ionization type meter was selected.

The instrument used had a stated useful range from 1 ppm full-scale to 100,000 ppm full-scale (based upon methane). These values were indicative but not limiting. The lowest range used during the program was 0 to 10 ppm of fuel vapor. The highest was 0 to 20,000 ppm of fuel vapor. Calibration to higher ranges would have been possible, but this was not necessary.

The original plan was to use two instruments. One was to be used to monitor ten fixed points, while the other was to monitor a scanner probe moving horizontally and vertically across selected planes in the simulated hangar space. This, however, would have greatly complicated data reduction and would have been poorly suited to the required full-scale hangar tests. After further study, it was decided to use a single instrument to monitor twenty-four fixed points placed in accordance with the needs of the experiment.

A 24-point Honeywell recording thermometer also was made available to the program. This was modified by the manufacturer to:

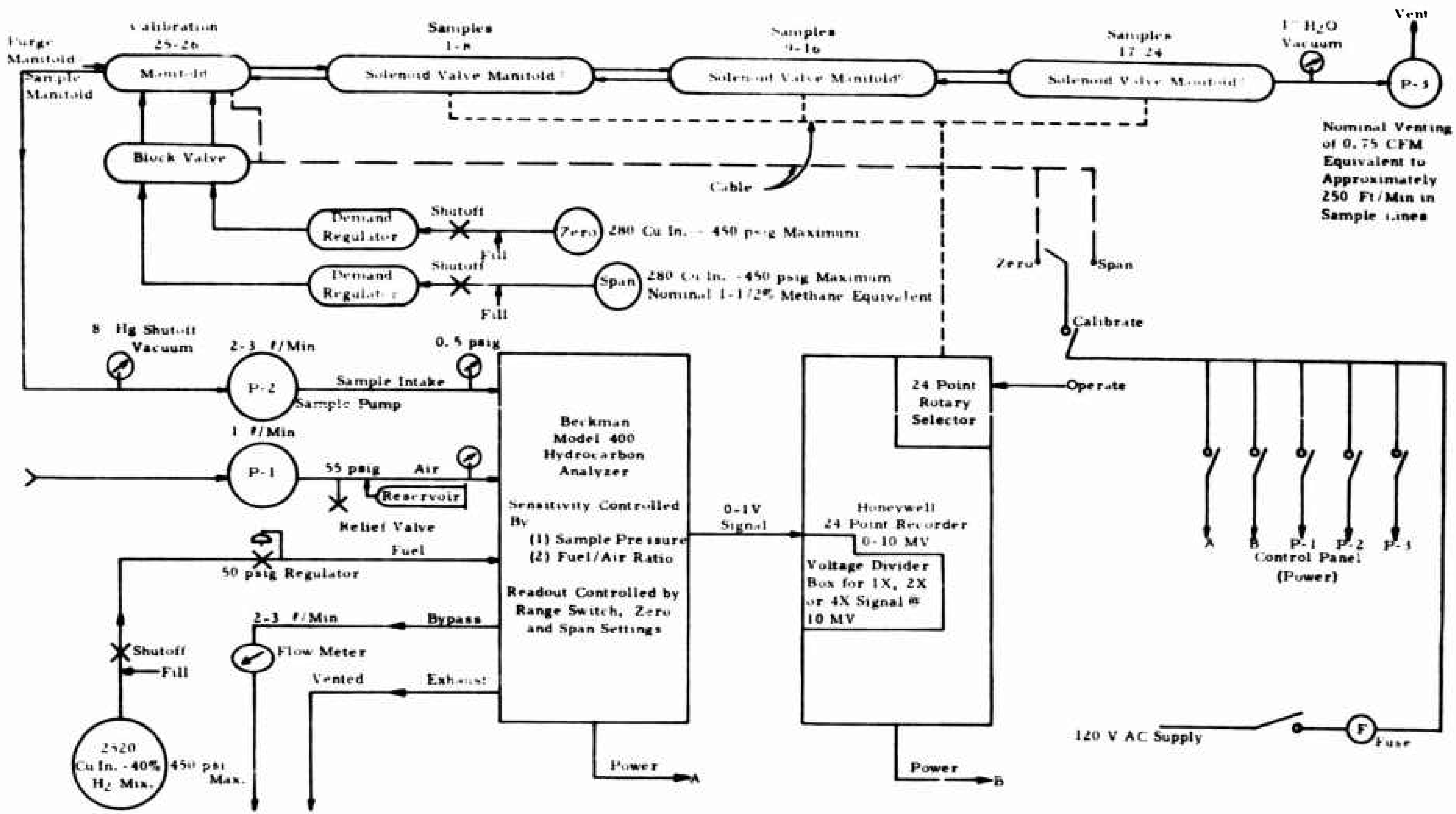
(1) isolate the 24-point thermocouple selector switch from the measuring circuit and convert it to a 120-VAC rotary selector switch to control the sampling solenoids;

(2) change the chart drive gear trains to print 12 points/in., regardless of time. This prevented overprinting of closely grouped data points;

(3) provide readily changeable drive motors to enable sampling speeds between 5 and 30 sec/point as desired; and

(4) calibrate the measuring circuits for 0 to 10 mV DC. To print out the signals from the fuel vapor measurements at each sample point.

An operational schematic of the instrument package is shown as Figure 2. The rotary switch on the Honeywell drive motor controls a bank of twenty-four 3-way solenoid valves. Normally each sample line (about 50 to 100 ft of 1/4-in. O.D. polyethylene tubing) was connected to a purge manifold, which exhausted a total of about 21 ℓ/min from the system, keeping a continually fresh sample at the manifold. As each sample solenoid was activated in turn, the stream was switched to the sample manifold. The sample pump sent 2 to 3 ℓ/min to a Beckman Model 400 Total Hydrocarbon Analyzer where it indicated the vapor content. The signal was then fed to the 24-point recorder through a small voltage divider box which enabled any reading to be multiplied by 2 or 4 for convenience in readout. At the conclusion of the sample period, the recorder printed an identified data point.



Three-way valves. Sample line normally connected to purge manifold (P-3); energizing solenoid transfers stream to sample manifold (P-2).

FIGURE 2. INSTRUMENT PACKAGE SYSTEM DIAGRAM

The instruments, pumps, and sampling system were assembled into a standard 6-ft rack cabinet. The lower portion contained nine pressure tanks rated at 500 psig which could contain enough of the 40-percent hydrogen/60-percent nitrogen fuel gas mix for the Beckman Analyzer to support operation for over a week. It also contained a switch selectable tank of calibration gas and a tank of nitrogen for a zero gas. The instrument package is illustrated in Figure 3.

It was constructed for complete portability and ready movement to any selected test site. Allowing time for warmup of the instrument and running sample lines, a test could be started approximately 4 hr after arrival at the point of intended use.

2. CALIBRATION

Calibration of any instrument, such as the Beckman Model 400 Analyzer to read total volume of a mixture of hydrocarbon vapors, requires the determination of a typical analysis so that a reference gas can be prepared. Since the desired end product of the study was related to the LEL of aviation fuel vapors, advantage was taken of Zabetakis' (Ref. 5) work in this area. He points out that there is some disagreement on the flammability limit of fuel blends, but suggests these values:

Fuel	LEL (Vol %)
Avgas 100/130	1.3
Avgas 115/145	1.2
Jet Fuel JP-4	1.3

The LEL of a fuel vapor blend is related to the LEL of its various components, and the same reference cites these figures:

Compound	LEL (Vol %)
Methane	5.0
Ethane	3.0
Propane	2.1
Butane	1.8
Pentane	1.4
Hexane	1.2
Heptane	1.05
Octane	0.95

Cross plotting vapor LEL's with the number of carbon atoms involved (as shown in Figure 4), it may be seen that a typical aviation fuel spill would have an averaged LEL of approximately 1.25 percent, corresponding to a pentane/hexane mix with a median of 5.75 carbon atoms per molecule. The vapor would also contain relatively small amounts of butane and heavy ends. Some slight differences could be expected between the heavy ends from avgas and those from JP-4 by reason of the higher final boiling point of JP-4.

For the same volume percentage, an aviation fuel vapor would read 5.75 times higher on the analyzer than methane vapor. This fact was used in preparing the calibration gas. Methane was selected as the basic component gas since it would remain in the vapor state when stored and mixed at high pressures.

The calibration sample was prepared by charging 1-1/2 atm of methane to an evacuated pressure cylinder which was then pressurized by adding 100 atm of compressed air. This was equilibrated for 4 days with a steam coil and water coil on opposite sides of the cylinder to set up convection mixing currents. The contents were then analyzed on a Perkin-Elmer Gas Chromotograph against a reference sample prepared by injecting 10 ml of pure methane into a 1000-ml flask. Three runs on each gas, with run-to-run errors under 5 percent, showed the calibration gas contained 1.34 percent of methane.

In use, the gas was equivalent to 1.34 percent/5.75 percent or 0.233 percent of typical fuel vapor. As may be seen from Figure 2, a calibration gas cylinder was readily available at the input manifold. Before, during, and after each run; the instrument was set either to 10,000-ppm full-scale (2330 ppm) in calibration, or 20,000-ppm full-scale (1165 ppm) as required by the experiment.

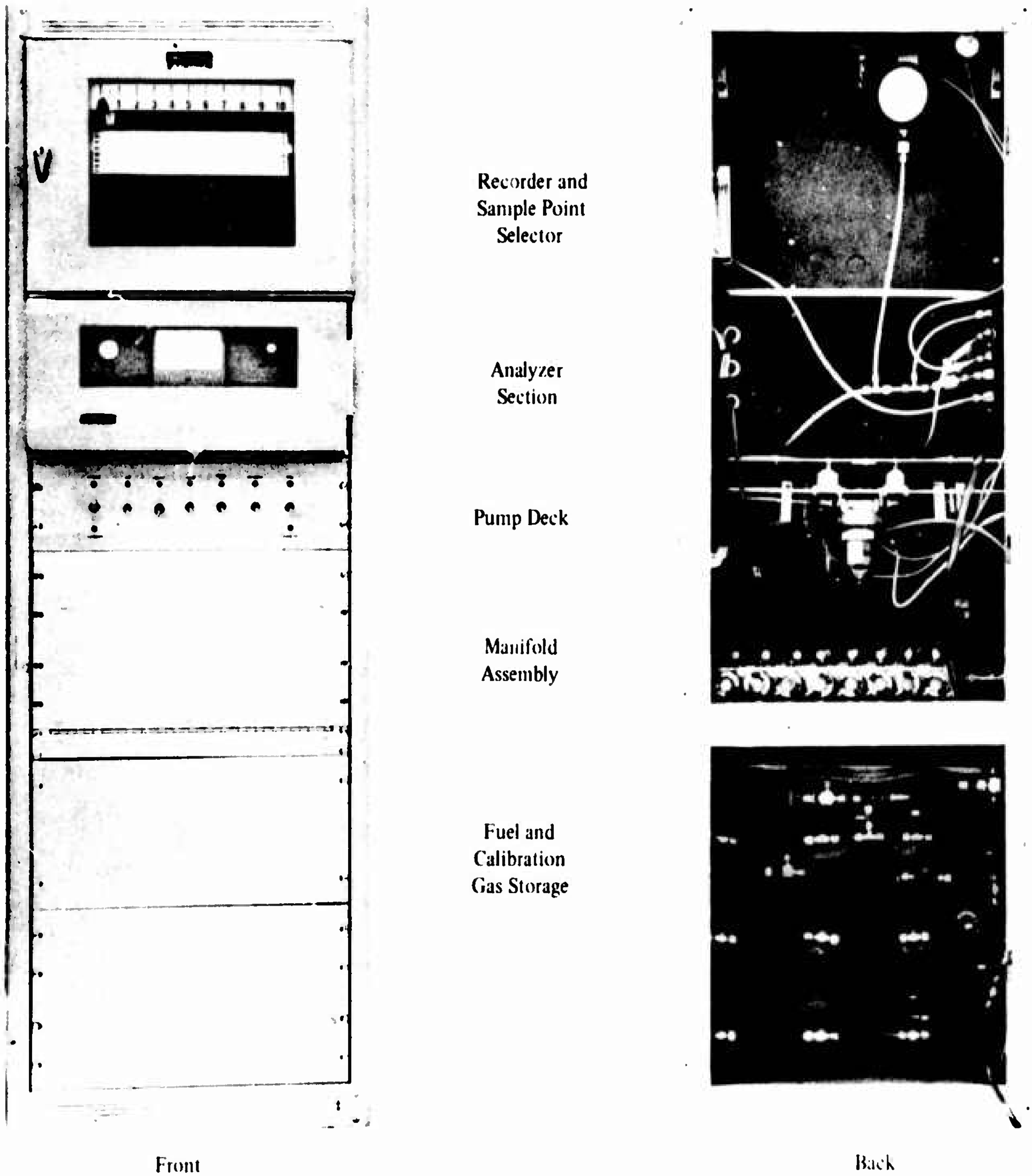


FIGURE 3. PHOTOGRAPH OF INSTRUMENT PACKAGE

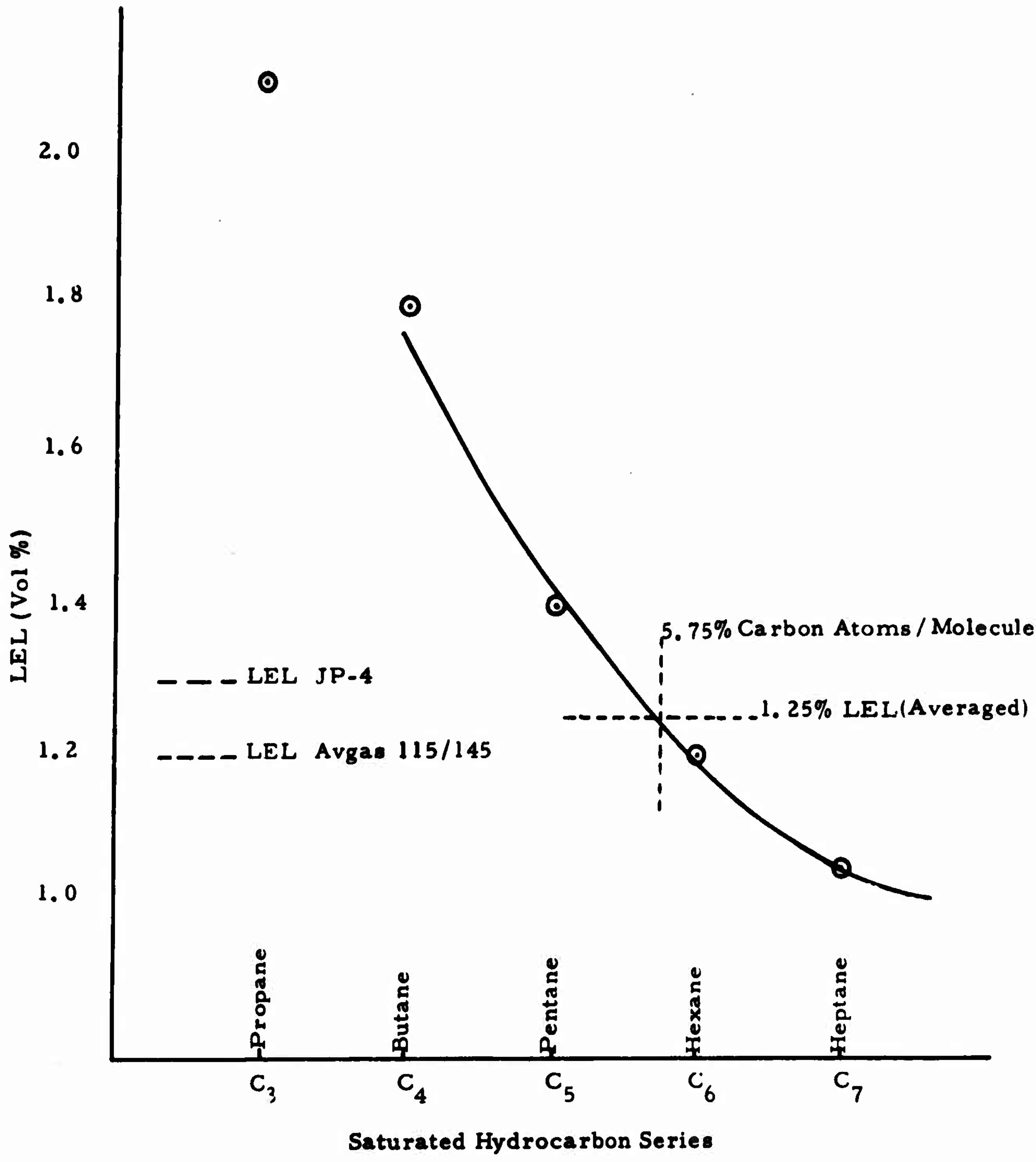


FIGURE 4. LOWER EXPLOSIVE LIMITS FOR FUELS AND VARIOUS SATURATED HYDROCARBONS

3. SAMPLING CONSIDERATIONS

For acceptable results, the sampling process must not affect the conditions being observed. The sample must be promptly analyzed, and, in a multipoint system, proper separations must be maintained. These criteria received continual attention during the program.

At no times were significant volumes being used for analysis. The sample and purge pumps continually removed approximately 1 cfm, and this was less than the air leakage in-and-out expectable in the 1600-cu ft enclosure involved. The samples were drawn parallel to the floor to avoid any effects on the vapor layer. No approach velocity could be noted above or below the sample point, and, even in the same plane, it was difficult to detect with a hot wire anemometer. Nevertheless, in the final vertical profile series when sampling at 1/2-in. intervals above the floor, a special stack was constructed to insure horizontal low-velocity laminar sampling.

The purge pump maintained a fresh sample at the manifold at all times. Calculations indicated that the typical lags between sample entry and arrival at the manifold were between 10 and 25 seconds.

For adequate separation between samples, the volume of the sample system must be minimized, and the flow must be made high enough to completely flush out the preceding sample before a new measurement is made. The initial shakedown runs showed obvious sample overlap when running at 5 sec/point. A speed of 7.5 sec/point was marginal if appreciable changes in vapor concentration occurred. Most of the work was carried out at 10 or 15 sec/point, except for the long duration runs in USAF hangars where 30 sec/point was deemed adequate. In addition, each sampling plan was based on graduated cycling from areas of high-vapor concentration to areas of low-vapor concentration and back again, avoiding abrupt changes in vapor values.

Sampling was under continual study during the program. During the latter phases, the instrument package was modified to reduce the original sample manifold volume from 9 cu in. to 1.5 cu in. and to meter the sample flow rate. With these improvements, an instrument response time of 5 sec/point was anticipated. The sample system performed as expected, but the recorder bridge balance circuit could not respond fast enough to make the 5-sec cycle feasible without further modifications. Excellent response was secured at 10 sec/point.

SECTION IV

TEST FACILITIES

The program required extensive testing in a simulated hangar space, a term which was not defined in the Statement of Work but was left to the interpretation of the contractor. It also specified field tests in USAF hangars selected as suitable to the purpose.

1. SIMULATED HANGAR SPACE

An aircraft hangar is essentially little more than a sizeable building designed for the storage and maintenance of aircraft. Large end doors are provided to permit passage in and out. Hangars are reasonably draft free, and, in temperate or cold climates, heaters are installed for working comfort. Aircraft shelters and nose docks meet this general description, also.

For the purposes of these tests, it was felt that as long as a semiquiescent environment could be secured, size (within reason) was not especially important. An unused concrete structure with a builtup joist roof was available which would supply a 14 X 14-ft working space and an adjoining 10 X 10-ft instrument room. This was rehabilitated for the purpose, and a floor plan is shown in Figure 5. An inside view of the experimental space is shown in Figure 6.

In order to investigate the effect of drafts coming from under a hangar door, a 4-in. plenum space was constructed across the inside east wall. This extended to within 2 in. of the floor and connected to two 18-in., low-capacity, tangential blowers set into the wall. Only one was used in testing. The second was utilized to expedite ventilation between tests. Typical velocities produced during tests are indicated in Figure II-1 of Appendix II.

A 4-in. low-power, shaded-pole fan was placed in one corner to produce floor drafts from ventilation inside the building. The velocities are noted in Figure II-3 of Appendix II.

For the first part of tests all sample lines were supported on ringstands. A plastic-covered, wire-grid system was then installed for mounting the polyethylene sample lines and securing better spatial distribution. Diagrams of the sample locations (Figs. II-1 through II-9) are included in Appendix II. Portable electric unit heaters were used prior to all runs at high-ambient temperatures to achieve the desired conditions.

2. SELECTED USAF HANGARS

A survey of the San Antonio area showed numerous hangars which could be made available to the program. The requirement essentially was for one or more large hangars which, on occasion, were filled with fueled aircraft and where vapor concentration measurements could be made over a 2- or 3-day period under closed door conditions. Three hangars were considered at Kelly AFB, four at Randolph AFB, and three at Bergstrom AFB. The final choices were Hangar 935 at Kelly AFB (Texas Air National Guard, F-100's); Hangar 5 at Randolph AFB (Air Training Command, T-38's); and Hangar 4337 at Bergstrom AFB (Tactical Air Command, RF-4's). The respective commands afforded excellent cooperation in making these hangars available and in aiding project personnel in setting up the instrument package. Randolph AFB officials were especially helpful in authorizing the desired large-scale spill test at the conclusion of the monitoring runs. Sketches showing sample points of the hangars and their aircraft occupancy are included in Appendix II. Figure 7 is a photograph of the aircraft in Hangar 5 at Randolph AFB during Test 26. The aircraft shown represented maximum hangar parking occupancy. The tests at Kelly AFB and Bergstrom AFB were conducted with maximum maintenance occupancy. The spill test at Randolph AFB is illustrated in Figure 8, while the Bergstrom tests are shown in Figure 9. The number and positions of aircraft in occupancy are shown as Figures II-6, II-7, and II-9 of Appendix II.

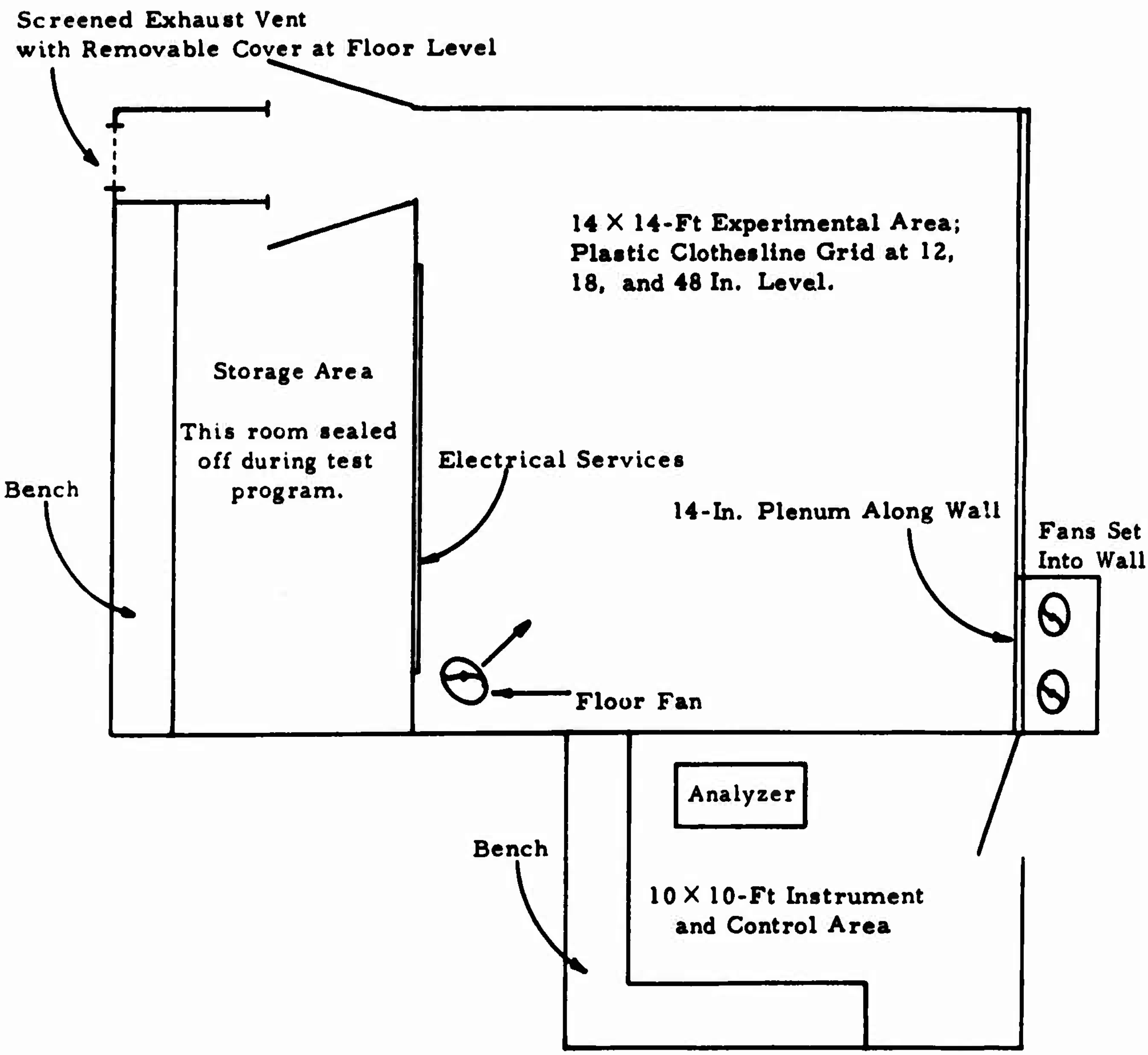


FIGURE 5. FLOOR PLAN-SIMULATED HANGAR SPACE

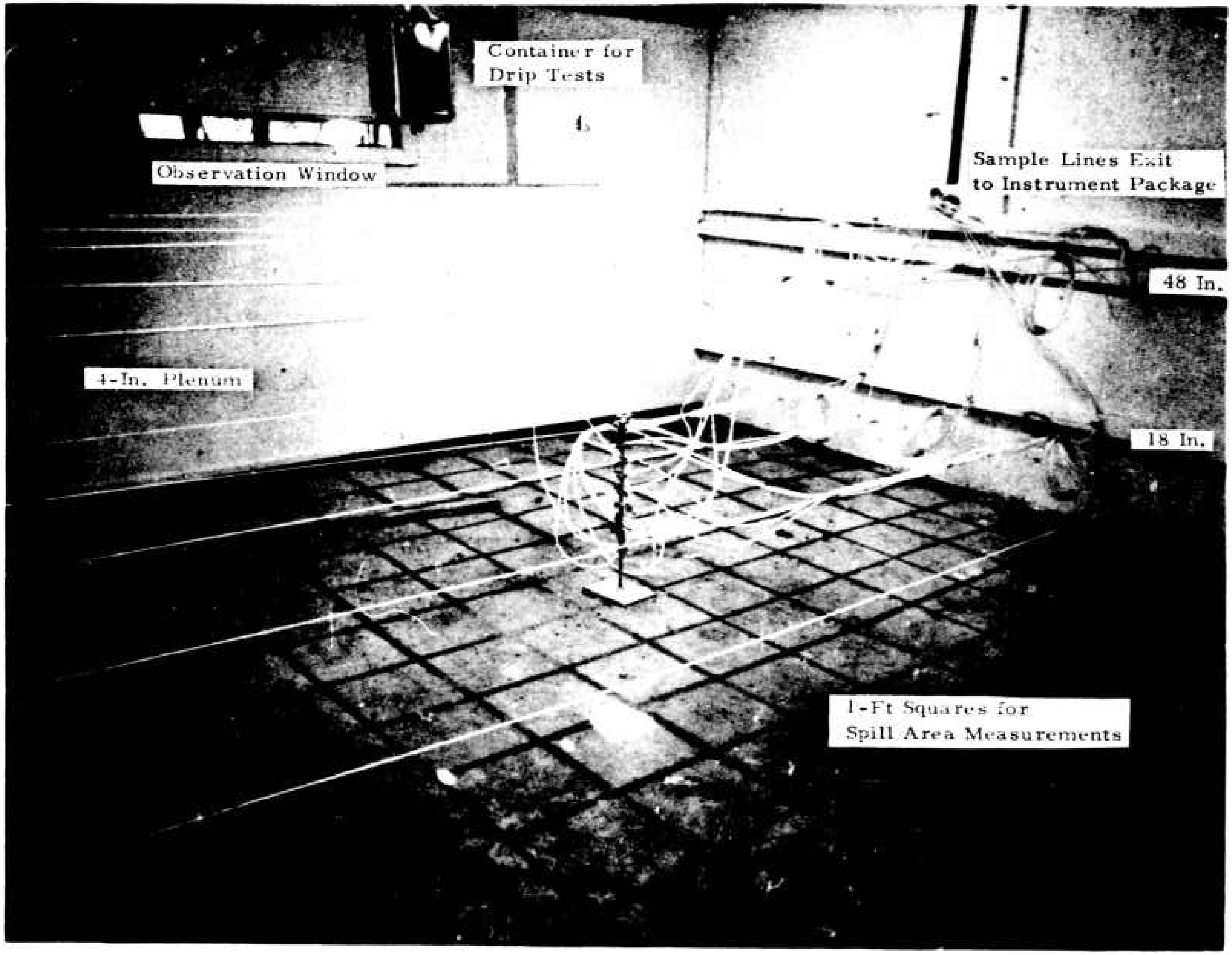


FIGURE 6. INTERIOR VIEW OF SIMULATED HANGAR SPACE

FIGURE 7. VIEW OF HANGAR 5, AT RANDOLPH AIR FORCE BASE, DURING TEST 26

FIGURE 8. VIEW OF HANGAR 5, RANDOLPH AIR FORCE BASE SPILL TEST 27

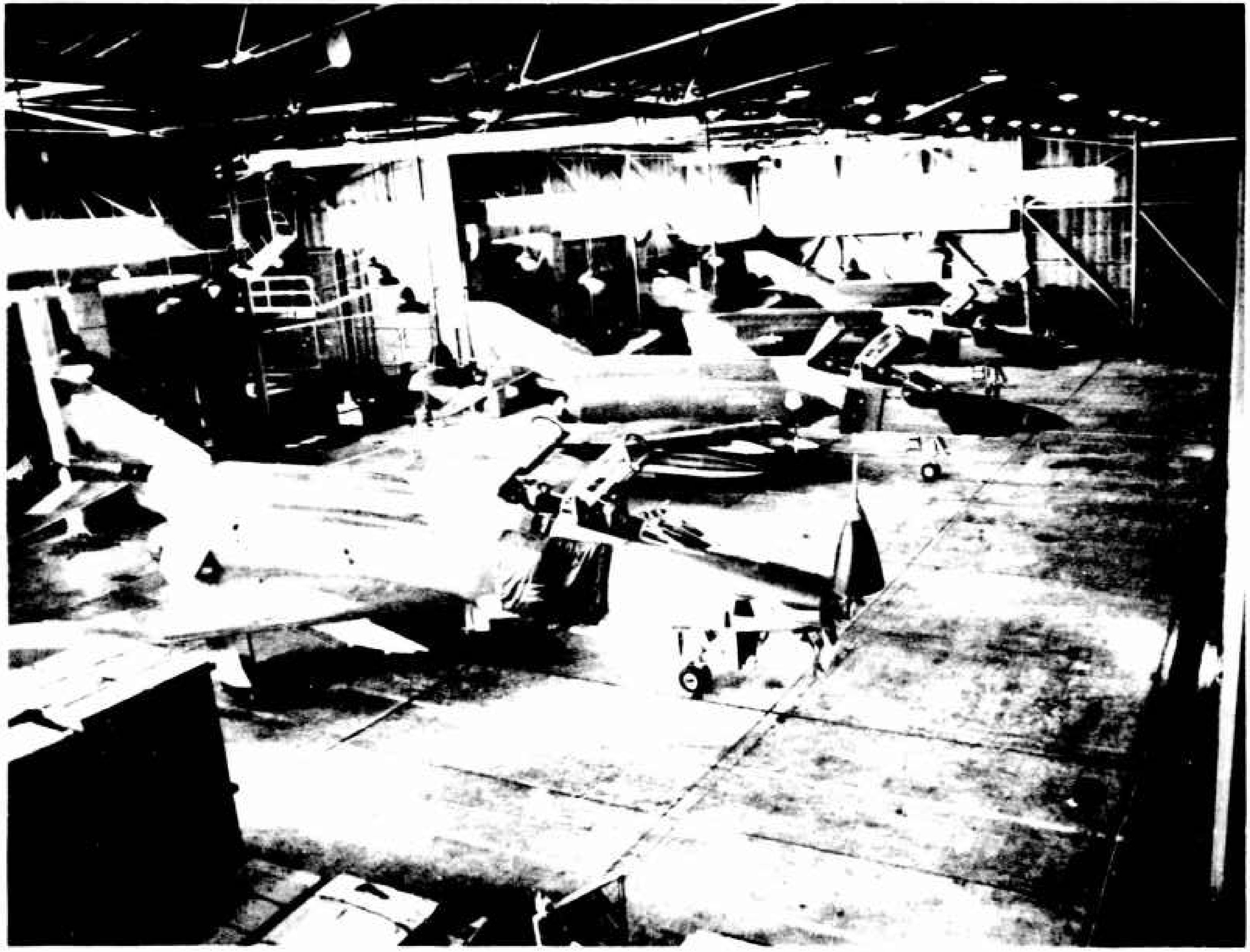


FIGURE 9. VIEW OF HANGAR 4337, AT BERGSTROM AIR FORCE BASE, DURING TEST 28

SECTION V

TEST PROGRAM CHRONOLOGY AND TABULATED RESULTS

In the absence of any known information on the subject, the experimental approach was almost completely empirical. The test facility attempted to simulate actual conditions in actual buildings so as to determine what could be expected in USAF hangars under spill or leakage conditions. As the data from each run were collected, they were used to plan succeeding tests until the character of the vapor distribution pattern began to make itself evident and the relative importance of the variables could be discerned. This resulted in three separate but interrelated phases for the simulated hangars plus a fourth phase of field testing in actual hangars at USAF bases.

1. PHASE 1

Tests 1 through 5 were exploratory in nature, investigating the way in which vapor from an open pan would spread along a single vertical plane at 4 to 16 in. above the floor, starting above the pan in the center and extending toward the wall. It also measured the effect of dumping fuel on the floor and introducing floor drafts. The sampling plan appears in Appendix II as Figure II-1. The results are summarized in Table 1.

The Phase 1 data did not support previously held theories on vapor distribution and on the magnitude of the explosibility hazard. Accordingly, the recorded values were not considered acceptable until they had been checked and confirmed by an MSA Model 2A Explosibility Meter. Even though the facility provided an essentially draft-free, quiescent environment and no obvious air movements could be detected, it was concluded that some air currents did, in fact, exist which could dilute the vapor concentrations at the immediate liquid surface or divert rich mixtures away from the sample points.

2. PHASE 2

In the light of the Phase 1 results, the logical step was to increase the spatial coverage of the sampling and investigate vapor concentrations at significant levels between floor and ceiling. A support grid of plastic-coated wire simplified location of sample points at 2, 12, 18, and 48 in. above the floor and at the 96-in. ceiling level. Five locations were checked at each level. These were 2 ft from the walls at each corner, corresponding to the hazard area definition used in AFM 88-15, and in the center of the room.

Phase 2 work included a total of twenty-two tests with an ambient temperature range of 50°F to 98°F. Relative humidity was also recorded, but it was quickly apparent that humidity did not affect the results. Phase 2 results are summarized in Table 2.

While the Phase 2 work was in progress, it was learned (Ref. 6) that Eastman Kodak had been conducting a comparable program on various solvents, both in the laboratory and in a 20 X 40 X 15-ft plastic-covered, field facility. This work confirmed the importance of convection mixing currents in producing low vapor concentrations and the inapplicability of diffusion law theories. Accordingly, even though the quiescent air conditions in the facility appeared representative of typical installation, special efforts, including the use of smoke bombs to indicate air leakage, were made to secure a tight vapor seal. Test 19 and succeeding runs were made with the better sealed facility. These were essentially a repetition of Tests 10 through 14 and 17 to check the effect of possible air cross-currents and improve the validity of the earlier data. As may be seen by comparing the data of Table 2, higher maximum values were usually observed close to the floor in the sealed chamber, indicating that vapor leakage in an unsealed building can be appreciable. There were no significant differences at higher levels.

After consultation with the Project Monitor, the accumulated data were made available to Eastman Kodak for analysis and a conference arranged to compare the two programs. It was found (Ref. 7) that although the experimental approaches differed appreciably, the results were generally in good agreement. The Eastman Kodak work has not been completed, and no decision has yet been reached on publication.

3. PHASE 3

As the investigation proceeded, it became increasingly apparent that vertical profile information on vapor concentrations would be needed. While maximum values exceeding the LEL were occasionally noted at the 2-in. level, values were never

TABLE 1. MAXIMUM VAPOR CONCENTRATIONS IN A 200-SQ-FT CLOSED ROOM, QUIESCENT CONDITIONS, SAMPLING IN A SINGLE PLANE

(LEL - 12,500 ppm)

Test Parameters	Test Number					
	1	2	3	4a*	4b*	5
Fuel	avgas	JP-4	avgas	avgas	avgas	JP-4
Vapor Source	pan	pan	pan	spill	spill with exhaust	pan
Wetted Area (sq ft)	6	6	5	35	35	5
Total Area (%)	3	3	2.5	17.5	17.5	2.5
Temperature (°F)	71	73	62	62	63	66
Vapor Concentration (ppm) at:						
16 In. Above Floor	1400	1100	730	3950	920	355
12 In. Above Floor	1600	1250	715	4100	950	150
8 In. Above Floor	1800	1240	665	4850	950	220
4 In. Above Floor	3350	2300	1000+	9750	900	475
Time to Reach Maximum (min)	24	72	114	24	n/a	96

*Tests 4a and 4b continue Test 3. Pan was dumped on floor. After peak concentration had been reached, air inlet fan was started.

TABLE 2. MAXIMUM VAPOR CONCENTRATIONS IN 200-SQ-FT CLOSED ROOM, QUIESCENT CONDITIONS, SAMPLING IN THREE VERTICAL PLANES

Test Parameters	Test Number 6	7	8	9	10	11	12	13	14
Fuel	avgas	JP-4	avgas	JP-4	JP-4	avgas	avgas	avgas	JP-4
Vapor Source	pan	pan	2-gal drip	2-gal drip	4-gal drip	4-gal drip	4-gal spill	4-gal spill	4-gal spill
Wetted Area (sq ft)	5	5	10	10	30	30	98	96	98
Total Area (%)	25	25	5	5	15	15	49	48	48
Temperature (°F)	60	75	72	54	71	79	52	98	95
Vapor Concentration (ppm) at:									
96 In. Above Floor	520	455	2, 700	850	800	1, 100	2, 500		2, 700
48 In. Above Floor	840	620	2, 800	1, 050	950	1, 450	3, 300	7, 300	2, 900
18 In. Above Floor	790	665	3, 450	1, 050	1, 050	1, 850	5, 200	9, 200	3, 200
12 In. Above Floor	920	750	3, 700	1, 000	1, 050	1, 900	7, 000	10, 000	4, 400
2 In. Above Floor	10, 000+	2, 850	10, 000+	3, 700	5, 100	9, 450	20, 000+	19, 800	20, 000+
Time to Reach Maximum (min)	10	4	34	282	60	258	3	3	4

Test Parameters	Test Number 15	16	17	18	19*	20*	21*	22*	30*
Fuel	avgas	avgas	JP-4	JP-4	JP-4	JP-4	JP-4	JP-4	avgas
Vapor Source	4-gal spill	10-gal spill	4-gal spill	10-gal spill	4-gal spill	4-gal spill	4-gal spill	4-gal spill	4-gal spill
Wetted Area (sq ft)	98	156	98	176	98	98	98	98	96
Total Area (%)	49	73	49	88	49	49	49	49	48
Temperature (°F)	52	60	50	64	67	67	61	77	82
Vapor Concentration (ppm) at:									
96 In. Above Floor	2, 400	1, 700	1, 600	1, 800	2, 900	1, 600	4, 400	1, 500	1, 750
48 In. Above Floor	2, 600	1, 600	1, 500	2, 800	2, 700	1, 200	4, 300	1, 000	1, 900
18 In. Above Floor	3, 600	1, 800	1, 800	2, 300	6, 700	5, 800	7, 400	2, 500	5, 650
12 In. Above Floor	4, 600	3, 500	1, 550	3, 900	10, 100	7, 800	10, 200	4, 300	8, 700
2 In. Above Floor	20, 000+	20, 000+	10, 200	20, 000+	20, 000+	20, 000+	20, 000+	20, 000+	20, 000+
Time to Reach Maximum (min)	6	7	11	7	3	7	7	7	3

Test Parameters	Test Number 30**	31*	31**	32*	32**	33*	33**
Fuel	avgas	JP-4	JP-4	avgas	avgas	JP-4	JP-4
Vapor Source	floor fan	4-gal spill	floor fan	4-gal drip	floor fan	4-gal drip	floor fan
Wetted Area (sq ft)	96	96	94	38	25	35	25
Total Area (%)	48	48	47	18	12.5	17.5	12.5
Temperature (°F)	82	89	89	90	90	85	85
Vapor Concentration (ppm) at:							
96 In. Above Floor	1, 250	275	125	3, 500	585	2, 000	1, 700
48 In. Above Floor	1, 900	350	350	5, 900	640	3, 300	2, 300
18 In. Above Floor	1, 900	450	450	7, 600	675	4, 300	3, 075
12 In. Above Floor	1, 900	550	475	8, 850	695	5, 400	3, 050
2 In. Above Floor	2, 250	10, 150	2, 750	20, 000+	930	20, 000+	13, 000
Time to Reach Maximum (min)	---	33	---	55	---	68	---

*Extra care taken in sealing room.
**Small fan on floor in corner aimed at center to simulate floor drafts.

Note: Values shown as 10, 000+ and 20, 000+ were slightly over range of instrument but did not warrant a change in scale.

Values are short time maximums. Duration may be obtained from data plots or tables in Appendixes III and IV.

See configurations II-2 and II-3 for sampling details.

observed at the next level, 12 in. above the floor, nor at the 18-in. level used in NEC Par. 513, nor at the 48-in. level used in AFM 88-15 to define the hazard zone. Tests 23 and 29 measured the vertical profiles for JP-4 and avgas spills at 2-in. intervals up to 24 in. above the floor in a sealed environment. As may be seen from the data of Table 3, the LEL could exist at 4 and 6 in. above the floor. Additionally, Tests 34 through 37 were run to examine the profile in more detail, sampling at 1/2-in. increments. Since the lowest points were close enough to the liquid surface of the spill so that surface conditions could be affected by sampling, extra care was taken through the use of a laminar flow, low-velocity sampling deck. The results of the Phase 3 tests are plotted in Figure 10 which shows that even when plotting short time maximums in a nontypical sealed environment, the actual hazard zone for the most volatile fuel was less than 8 in. above the floor.

4. ALL-PHASE WORK

Repeated checks were made of the effects of movements at floor level. It had been noted in Phase 1 that if project personnel entered the test chamber and walked across the room, the vapor concentration temporarily dropped at the 4-in. level. Tests 4b and 5 documented the air movement effect when a draft was simulated under the hangar door. The cross floor velocity was approximately 75 ft/minute. Air movement was again investigated during Tests 30 through 33, when a 4-in. flow fan was operated for a short time during the test. The location of the fan and air velocities are shown in Figure II-3 of Appendix II. In every case, any disturbance of the air at floor level immediately reduced the vapor concentration until the movement was stopped, at which time it gradually returned to near its previous equilibrium value.

5. PHASE 4

The required field tests in USAF hangars were planned on the basis of information from Phases 1, 2, and 3. Since the observed vapor concentrations had been so low in the small sealed test facility, it appeared that meaningful results in large open area hangars could be secured only in worst-case situations such as with tightly closed doors, maximum fueled aircraft occupancy, and conditions when fuel leaks or drips could occur.

Hangar doors are normally open during operations. A survey was taken, however, which revealed weekend periods for some hangars at Kelly AFB, Randolph AFB, and Bergstrom AFB during which "worst-case" tests could be run. The aircraft involved were the F-100, T-38, and RF-4. With the complete cooperation of all three Air Force Commands, weekend monitoring tests were set up at the three bases. These were designated as Tests 24 through 28. The sampling plans are shown in Figures II-6, II-7, and II-9 of Appendix II, while the results are listed as Table 4.

The large-scale spill test, which was to be run if a suitable facility could be obtained, was carried out as Test 27 at Randolph AFB, after conclusion of the monitoring tests. Hangar 5 was cleared of aircraft,and the doors were closed. The floor area, including two adjacent shops, was covered with sample lines as shown in Figure II-8 of Appendix II. The floor drains were sealed. With the Base Fire Department standing by to observe and monitor, a drum of JP-4 fuel was dumped on the floor. The test ran approximately 2-1/2 hr, after which the doors were opened and the floor washed down. The data for this test appear in Appendix IV as Table IV-27. Fire Department checks with a MSA Model 2A Explosibility Meter showed values at or above the LEL only at the immediate liquid level in a single low spot of the floor at the drain.

6. DATA REDUCTION

A total of 124,122 data points were recorded during this study covering some 600 hr of test operation. The tabulated data for each run are included as Appendix IV. To visualize better the physical relationships, the runs in the test facility have been plotted against time for various heights above the floor and are included as Appendix III. From these curves, it may be seen that the maximum vapor concentration values are of relatively short duration. Except close to the floor, the vapor explosibility hazard is essentially nonexistent.

No effects could be noted that related to barometric pressure or humidity. Theoretically, pressure or humidity would be relevant only if diffusion theory had been shown to be controlling, which was not the case.

In the same manner, the hazard differences between avgas and JP-4 fuels for spill conditions with limited amounts were not significant, nor was the temperature. Avgas and JP-4 are both essentially high-volatility fuels as far as flash point is concerned. Their volatile fractions are almost the same. The primary difference between these fuels is the amount per gallon of each fuel that will readily evaporate in a given length of time. Differences in ambient temperature vary the thermal driving force which is measured from the below-zero (°F) flash point. At elevated temperatures, the volatile fractions of both fuels

TABLE 3. VERTICAL PROFILES OF MAXIMUM VAPOR CONCENTRATIONS IN SEALED ROOM

Test No.	23	29	34	35	36	37
Fuel	JP-4	avgas	avgas	JP-4	avgas	avgas
Type	4-gal spill	4-gal spill	4-gal spill	4-gal spill	4-gal spill	4-gal drip
Area (sq ft)	94	98	150	120	140	16
Area (%)	47	49	75	60	70	8
Temp (°F)	62	69	75	83	87	76
Height Above Floor (in.)	ppm	ppm	ppm	ppm	ppm	ppm
24	1200	1300	-	-	-	-
22	1300	1500	-	-	-	-
20	1700	2900	-	-	-	-
18	1700	3300	-	-	-	-
16	1300	3900	-	-	-	-
14	1600	4700	-	-	-	-
12	1500	5200	8100	4300	5900	7400
11.5	-	-	8600	4400	5800	7400
11.0	-	-	8300	4400	5900	7400
10.5	-	-	9000	5400	6200	7600
10.0	1900	7100	8900	5900	6300	7800
9.5	-	-	10000	6200	6400	7900
9.0	-	-	9800	6700	6400	8100
8.5	-	-	10800	7100	6700	8300
8.0	3600	9200	10600	7300	7100	8500
7.5	-	-	11600	7600	7400	8800
7.0	-	-	11700	7900	7900	9000
6.5	-	-	12400	8200	8100	9300
6.0	6500	12100	12700	8500	8800	9500
5.5	-	-	13300	8600	8900	9800
5.0	-	-	13400	8800	9500	10300
4.5	-	-	14100	9000	9500	10500
4.0	13300	16900	14100	9300	9900	10600
3.5	-	-	14900	9500	10400	10900
3.0	-	-	14900	10100	10800	11200
2.5	-	-	15900	10100	11100	11300
2.0	16000	19800	16000	10500	11600	11600
1.5	-	-	16600	10600	12100	11900
1.0	-	-	16700	11000	12600	12300
0.5	-	-	18400	12200	13800	13900

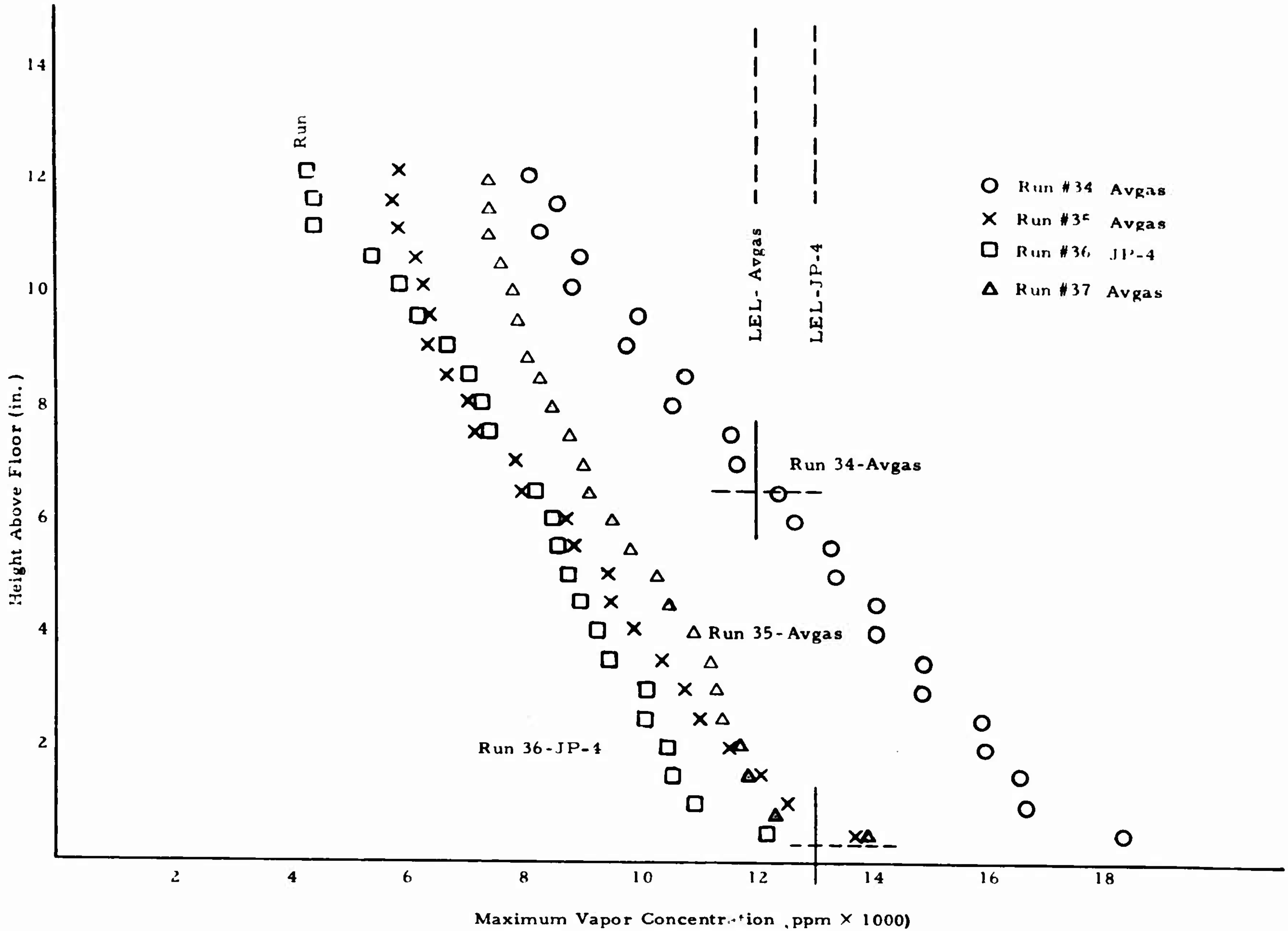


FIGURE 10. VERTICAL PROFILES OF VAPOR CONCENTRATION, TESTS 34-37

TABLE 4. MAXIMUM VAPOR CONCENTRATIONS IN SELECTED TYPICAL USAF HANGARS

(LEL 12,500 ppm)

Test No.	24	25	26	27	28
Fuel	JP-4	JP-4	JP-4	JP-4	JP-4
Type	monitor	monitor	monitor	55-gal spill	monitor
Location	Kelly AFB	Kelly AFB	Randolph AFB	Randolph AFB	Bergstrom AFB
Aircraft	F-100	F-100	T-38	None	RF-4
Temperature (°F)	65	65	65	57	46-66
Vapor Concentration (ppm) at:					
18 In. Above Floor	NA	NA	NA	1175	NA
10 In. Above Floor	NA	NA	NA	1755	NA
2 In. Above Floor	40	26	24	2660*	1000+**
Length of Run	45 hr 30 min	118 hr 30 min	63 hr 18 min	3 hr 48 min	61 hr 36 min

*Maximum value in two adjoining rooms, door closed, was 340 ppm at 35 min.

**Maximum value was recorded 6 in. from 2 × 4 ft × 3-in. pan catching dripping JP-4 from wing tank fuel expansion. Typical maximums in other areas were 50 ppm or less.

would evaporate more rapidly and be dissipated sooner. That is, the vapor concentrations reached would be strongly affected by temperature differences within the room. The temperature differences also act as the driving forces for the diluting convection currents within the room.

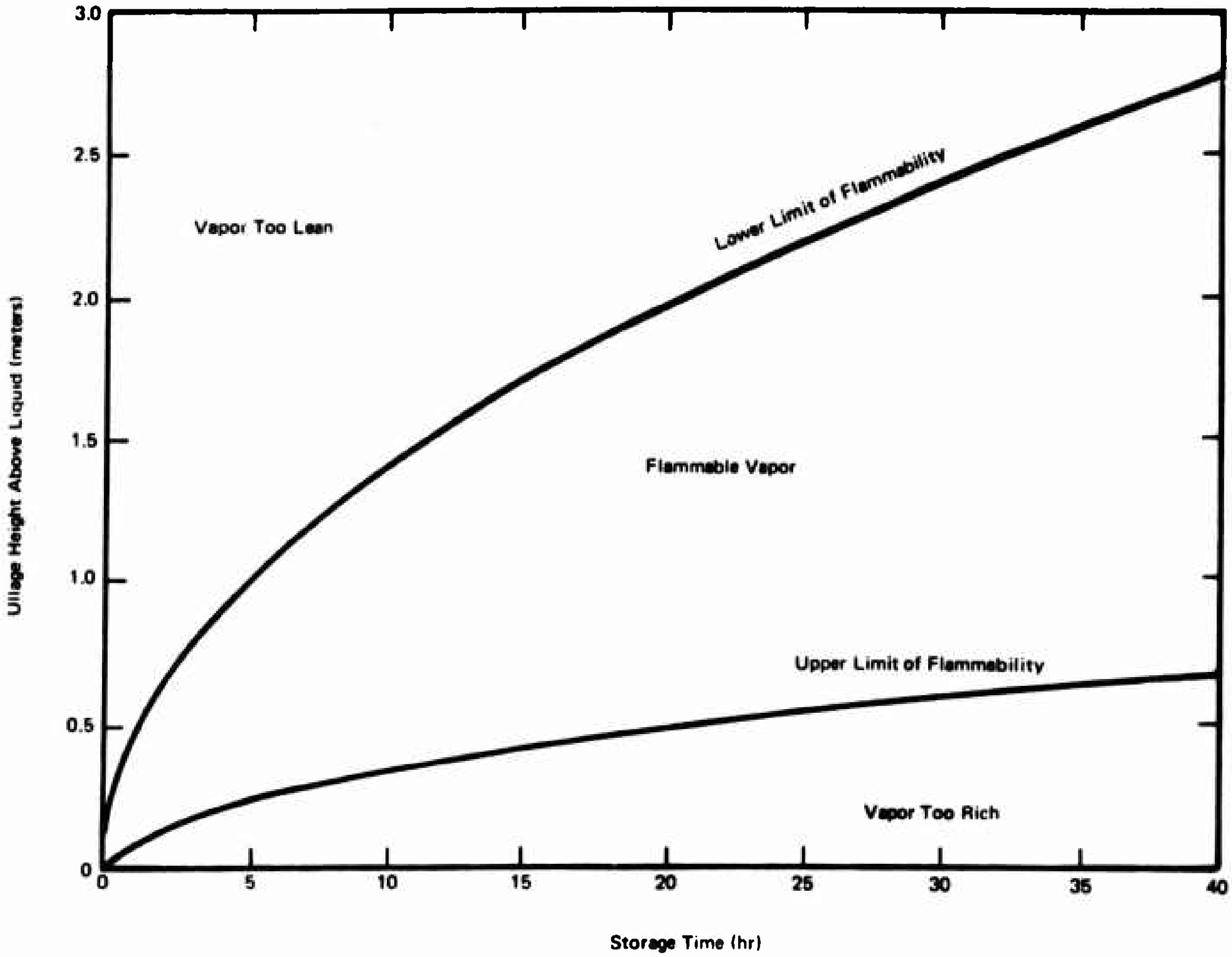
SECTION VI

ANALYSIS OF RESULTS AND CONCLUSIONS

1. DISCUSSION OF THE TEST RESULTS

At the outset of the program, it was expected that spills and leaks in aircraft hangars would follow a general pattern predictable from classical diffusion theory. If this were true, then for any given time after a spill, it would be possible to calculate the accumulated vapor build-up from the floor, up to any level.

An example of such a theoretical calculation for benzene is shown as Figure 11 (Ref 8). Zabetakis (Ref 5) gives 1.3 percent and 7.9 percent, respectively, for the LEL and UEL values of this material. These are about the same as for aviation fuel vapors so that the chart for such spills would be comparable.



Source: Ref 8.

FIGURE 11. CALCULATED DIFFUSION OF BENZENE INTO AIR

These calculations assumed an unlimited supply of the pure compound, an isothermal environment, and only molecular diffusion forces to accomplish the liquid-vapor-air mixing process. Such assumptions are completely unrealistic for the spill of some definite quantity of an aviation fuel, consisting of a blended hydrocarbon mixture in a building where floor-to-wall-to

ceiling temperature differences set up small but appreciable convection currents. Also, it has been believed that after any spill, the rapid flashoff of volatiles would create a rich vapor which would drift or be moved by convection currents, essentially undiluted, toward potential ignition points. Obviously, such a condition could be hazardous and would justify establishment of appropriate safety standards.

None of the experimental work conducted in this program supported this rich cloud concept. They did show that under extreme spill conditions in a small confined area, the vapor concentration could gradually build up and approach the LEL in a layer as high as 7 in. above the floor. The general vertical profile of maximum observed values, irrespective of time reached, is illustrated in Figure 10. It was also noticed that for any spill in a quiescent environment where the fuel collected in small pools on a rough concrete floor, a value near the LEL at the 1/2-in. level could continue for several hours. In the laboratory facility, maximum values slightly over 20,000 ppm were recorded at the 2-in. level on numerous occasions, but these could not be produced at will. Low-velocity convection currents produced by floor-wall-ceiling temperature differences appeared to be the controlling factor. Any disturbance causing air movement, regardless of how produced, caused dissipation of rich vapors and lowering of concentrations. As previously pointed out, the effect was noticeable whenever project personnel entered the chamber causing some air movement during a run. This was documented several times.

The concentrations observed in the confined test facility do not necessarily apply to typical USAF hangars with their large open areas where both convection currents and cross ventilation from external wind pressures can quickly sweep away and dilute fuel vapors to safe levels.

In Test 27, the open floor fuel spill at Randolph AFB, none of the readings at the 2-in. level exceeded 2660 ppm (21% of LEL), even at the edges of the spill. Scanning with an MSA Explosimeter showed readings above the LEL only at the immediate fuel surface in a low spot on the floor. The rich vapor layer, if any existed, could not be found as high as 1/2 in. off the floor. Under such conditions, it would not be logical to expect vapor travel along the floor into the adjacent hangar offices and shops, where none was detected.

A comparable effect was noted during Test 28 at Bergstrom AFB, when the area beside a 2 X 4-ft pan receiving JP-4 from a dripping RF-4 fuel tank never exceeded 1000 ppm (8% of LEL) at the 2-in. level.

The mass of data gathered in this study indicate that the overall mechanism is one in which the generation of vapor is evaporation-rate limited. That is, it is controlled by the ambient temperature and the vapor pressures of the volatile compounds in the fuels spilled.

The vapor concentrations in the spill area are determined by an equilibrium between the quantity of vapor evolved and the rapidity with which it is swept away and diluted by air currents. Classical diffusion theory, as such, does not apply under these conditions. Comparable results were obtained by Eastman Kodak in the previously cited work (Ref 7).

The data also indicate that most environmental factors have relatively little effect upon the results. Ambient temperature, barometric pressure, and relative humidity were found to be irrelevant. The differences between avgas and JP-4 were not appreciable. Both are high-volatility fuels and act in much the same manner. With any straight kerosene low-volatility fuel (such as JP-5, JP-8, or Jet A), the estimated hazard zone would appear to be well under the 2-in. level. A high degree of confinement and a volatile fuel can raise the hazard zone up to approximately 6 to 7 in. above the floor. Under such conditions, there is little or no justification for some protective techniques such as vapor seal barriers or pressurizing areas to prevent inward vapor flow.

Any device to produce positive air movement at floor level will immediately reduce the vapor concentration at the floor to a low level. This was demonstrated in Test 4B and again in Tests 30 through 33. For any confined area subject to spills, the use of an exhaust fan taking suction at floor level would be a logical and effective safety measure.

The objective of this research effort was to determine the extent of hazardous concentrations of explosive vapors in aircraft hangars in order to define areas which require explosion-proof electrical wiring and equipment. From the values shown in Figure 10 for a confined area, which is in itself an extreme situation, it can be seen that the nonhazardous area for hangars could be established as beginning at 12 inches above the floor and still retain an adequate margin of safety. This conclusion is supported by the results of actual tests in USAF hangars.

In the absence of measuring equipment, a strong smell of fuel vapors tends to alert personnel to the possible existence of an explosion hazard. It was noted again and again that such smells could exist at concentrations as low as 50 ppm—far below the LEL. The light petroleum vapors which constitute the hazard are odorless. The residual sulfur components which can be detected by the nose are no index as to the vapor concentration and can lead to highly erroneous conclusions as to the degree of hazard.

2. CONCLUSIONS

Presented in order, the following conclusions have been reached during the progress of the study:

(1) Any spill or leak of a flammable liquid in a hangar can represent a fire hazard consistent with the amount released. The overall vapor explosibility hazard is low, of relatively short duration, and confined to a space only a few inches above the floor.

(2) Even with the use of the most volatile fuels and spills covering up to 38 percent of the floor area, the expected vapor concentration was below the LEL at the 12-in. level. Thus, ordinary sized spills or leaks, representing up to 25 percent or more of the floor area, do not represent a serious vapor explosibility hazard. Ordinary washdown procedures not only reduce the fuel present but supply vapor mixing and dilution as well.

(3) There appears to be little practical difference between avgas and JP-4 in their vapor hazard aspects except that avgas has a higher volatile content. Avgas can be expected to vaporize more rapidly and reach a somewhat higher short period peak vapor concentration within the 12-in. distance.

(4) Fuel evaporation rate is temperature dependent. As the ambient temperature is increased, vapor is released more rapidly, and the available volatiles are dissipated in less time. There appears to be no significant effect on vapor concentrations within normal hangar temperature ranges. Humidity and barometric pressure are insignificant factors in the evaporation process.

(5) Since normal convection currents in hangars already serve to dilute and dissipate vapors (keeping them below the LEL at working levels), the effect of hangar door cracks and openings is not significant, except to further improve ventilation and decrease vapor concentrations.

(6) No penetration of vapors through closed doors or wall openings into adjoining areas was observed during the spill test at Randolph AFB. There was an intervening 3-in. sill between the spaces, and blocking of the high concentrations expectable along the floor could have been due either to this low barrier or to dissipation of the vapor by convection currents before it reached the wall.

(7) Inasmuch as no penetration of vapors into adjacent unpressurized areas could be observed, there is no justification for pressurizing to block vapor flow.

(8) Experiments investigated the action of a floor level fan and showed it to be extremely effective in lowering vapor concentrations. This is a mixing and dissipating action and does not require the vapor to be exhausted from the building.

(9) Reviewing the provisions of Paragraphs 7 through 10 Hazardous Areas, of AFM 88-15 in the light of the test program and the preceding conclusions, it appears that a redefinition of the hazards is warranted.

3. RECOMMENDED REVISED TEXT FOR PAR 7-10, AFM 88-15

The following is recommended as a revision of AFM 88-15:

7-10. Hazardous Areas:

a. *Requirements.* Unless otherwise authorized, wiring materials and equipment within hazardous areas shall conform to the requirements for the particular hazard involved as specified in the National Electrical Code.

b. *Hangars and Docks*:

(1) All spaces below grade shall be considered to be Class 1, Division 1, Group D of hazardous locations.

(a) The entire area of the hangar, including any adjacent and communicating areas not suitably cut off, shall be considered to be Class 1, Division 2, Group D hazardous locations up to a level 12 in. above the floor.

(b) Where docks and hangars are used for fuel system and fuel cell repairs, the above criteria are applicable provided that any other special treatment requirements are also met.

(c) Wiring and equipment in nonhazardous areas shall meet the requirements of the National Electrical Code.

(d) Adjacent areas cut off at floor level by a barrier not less than 3-ft high are considered nonhazardous unless the usage of the area is hazardous.

c. *POL Areas.* All spaces below grade shall be considered Class 1, Division 1, Group D hazardous areas. The following spaces shall be considered Class 1, Division 2, Group D hazardous areas:

(1) Above grade pump, valve rooms, or similar areas.

(2) Locations within 20 ft of tank vents.

(3) Locations within tank dikes.

(4) Within 50 ft of tank loading or unloading outlets.

d. *General.* Any spaces above ground normally considered to be Class 1 Division 2 may be specified to fall within Division 1 if evidence exists that vapor concentrations exceeding the LEL regularly exist at least 2 inches above grade in the vicinity of electrical equipment.

APPENDIX I

EXCERPTS FROM AFM 88-15 AND NATIONAL ELECTRICAL CODE

Excerpts from AFM 88-15, 3 March 1970

7–10. Hazardous Areas:

a. *Requirements.* Unless otherwise authorized, wiring materials and equipment within hazardous areas shall conform to the requirements for the particular hazard involved as specified in the National Electrical Code.

b. *Hangars and Docks*:

(1) The following spaces are considered to be class 1, division 1, group C of hazardous locations:

(a) The main hangar or dock area inclosed by the building walls, exclusive of adjoining rooms, and extending from the floor to the top of highest hangar door, except for the space within 2 feet of the wall above a 4-foot level. (Special situations wherein encroachment may be acceptable due to particular aircraft size or configuration will be referred to AFOCE-KC.)

(b) The space below a 4 foot level from the floor in adjacent areas not cut off from the main area by doors or walls.

(c) The space below an 18 inch level from the floor in adjacent areas cut off from the main area by doors or walls subject to fume leakage.

(2) Adjacent areas cut off from the main area by a minimum 4 foot elevation or by walls not subject to fume leakage are considered nonhazardous unless the usage of the specific area itself is hazardous.

(3) All fixed electrical equipment and wiring should be located outside the hazardous space, wherever possible. If, in special cases, it is necessary to encroach into the hazardous space for installation of nonexplosion proof equipment, such equipment will be confined to the space 5 feet or more above the upper surface, or 5 feet or more horizontally out from the edges of the wings, fuselage, or any part of the aircraft which normally contains fuel tanks or vents for the largest aircraft that can be accommodated in the facility.

(4) Where docks and hangars are used for fuel system and fuel cell repair the above criteria are applicable, provided other special treatment requirements (vapor detection, fuel disposal, and approved exhaust air movements) are also met.

(5) Except as specifically stated above, all remaining electrical wiring and equipment shall meet requirements of the National Electrical Code.

c. *POL Areas.* Electrical equipment will be explosion proof as approved for class 1, group C, division 1, locations when installed under the following conditions.

(1) In below-grade housing or pits.

(2) In above-grade pump rooms, valve rooms, and similar areas.

(3) Within 20 feet of vents for underground tanks.

(4) Within dikes of above-ground tanks.

(5) Within 50 feet of tank loading or unloading outlets.

d. When required for industrial areas, explosion-proof lighting fixtures will be of incandescent type. Fluorescent type is not permitted in these areas.

NATIONAL ELECTRICAL CODE

ARTICLE 500 — HAZARDOUS LOCATIONS

500-1. Scope. The provisions of Articles 500 through 503 apply to locations in which the authority having jurisdiction judges the apparatus and wiring to be subject to the conditions indicated by the following classifications. It is intended that each room, section or area (including motor and generator rooms, and rooms for the enclosure of control equipment) shall be considered individually in determining its classification. Except as modified in Articles 500 through 503, all other applicable rules contained in this Code shall apply to electrical apparatus and wiring installed in hazardous locations. For definitions of "approved" and "explosion-proof" as used in these Articles, refer to Article 100. "dust-ignition-proof" is defined in Section 502-1.

Equipment and associated wiring approved as intrinsically safe may be installed in any hazardous location for which it is approved, and the provisions of Articles 500 through 517 need not apply to such installation. Intrinsically safe equipment and wiring are incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture. Abnormal conditions will include accidental damage to any part of the equipment or wiring, insulation or other failure of electrical components, application of overvoltage, adjustment and maintenance operations, and other similar conditions.

For further information see NFPA No. 493-1969 Standard for Intrinsically Safe Process Control Equipment for use in Class I Hazardous Locations.

Through the exercise of ingenuity in the layout of electrical installations for hazardous locations, it is frequently possible to locate much of the equipment in less hazardous or in nonhazardous areas and thus to reduce the amount of special equipment required. In some cases, hazards may be reduced or hazardous areas limited or eliminated by adequate positive-pressure ventilation from a source of clean air in conjunction with effective safeguards against ventilation failure. For further information see NFPA No. 496-1967 Standard for Purged Enclosures for Electrical Equipment in Hazardous Locations. It is recommended also that the authority having jurisdiction be familiar with such recorded industrial experience as well as with

Table 500-2(b). Identification Numbers

Maximum Temperature Degrees C	Maximum Temperature Degrees F	Identification Number
450	842	T1
300	572	T2
280	536	T2A
260	500	T2B
230	446	T2C
215	419	T2D
200	392	T3
180	356	T3A
165	329	T3B
160	320	T3C
135	275	T4
120	248	T4A
100	212	T5
85	185	T6

Table 500-2(c). Chemicals by Groups

Group A Atmospheres

Chemical

acetylene

Group B Atmospheres

butadiene[1]
ethylene oxide[2]
hydrogen
manufactured gases containing more than 30% hydrogen (by volume)
propylene oxide[2]

Group C Atmospheres

acetaldehyde
cyclopropane
diethyl ether
ethylene
isoprene
unsymmetrical dimethyl hydrazine (UDMH 1, 1-dimethyl hydrazine)

Group D Atmospheres

Chemical

acetone
acrylonitrile
ammonia[3]
benzene
butane
1-butanol (butyl alcohol)
2-butanol (secondary butyl alcohol)
n-butyl acetate
isobutyl acetate
ethane
ethanol (ethyl alcohol)
ethyl acetate
ethylene dichloride
gasoline
heptanes
hexanes
methane (natural gas)
methanol (methyl alcohol)
3-methyl-1-butanol (isoamyl alcohol)
methyl ethyl ketone
methyl isobutyl ketone
2-methyl-1-propanol (isobutyl alcohol)
2-methyl-2-propanol (tertiary butyl alcohol)
petroleum naphtha[4]
octanes
pentanes
1-pentanol (amyl alcohol)
propane
1-propanol (propyl alcohol)
2-propanol (isopropyl alcohol)
propylene
styrene
toluene
vinyl acetate
vinyl chloride
xylenes

[1] Group D equipment may be used for this atmosphere if such equipment is isolated in accordance with Section 501-5(a) by sealing all conduit ½-inch size or larger.

[2] Group C equipment may be used for this atmosphere if such equipment is isolated in accordance with Section 501-5(a) by sealing all conduit ½-inch size or larger.

[3] For Classification of areas involving ammonia atmosphere refer to ANSI B9.1 Safety Code for Mechanical Refrigeration-1971 and ANSI K61.1 Storage and Handling of Anhydrous Ammonia-1971.

[4] A saturated hydrocarbon mixture boiling in the range 20–135°C (68–275°F). Also known by the synonyms benzine, ligroin, petroleum ether or naptha.

500-4. Class I Locations. Class I locations are those in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitible mixtures. Class I locations shall include the following:

(a) Class I, Division 1. Locations (1) in which hazardous concentrations of flammable gases or vapors exist continuously, intermittently, or periodically under normal operating conditions, (2) in which hazardous concentrations of such gases or vapors may exist frequently because of repair or maintenance operations or because of leakage, or (3) in which breakdown or faulty operation of equipment or processes which might release hazardous concentrations of flammable gases or vapors, might also cause simultaneous failure of electrical equipment.

This classification usually includes locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another; interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used; locations containing open tanks or vats of volatile flammable liquids; drying rooms or compartments for the evaporation of flammable solvents; locations containing fat and oil extraction apparatus using volatile flammable solvents; portions of cleaning and dyeing plants where hazardous liquids are used; gas generator rooms and other portions of gas manufacturing plants where flammable gas may escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile, flammable materials are stored in open, lightly stoppered, or easily ruptured containers, and all other locations where hazardous concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

(b) Class I, Division 2. Locations (1) in which volatile flammable liquids or flammable gases are handled, processed or used, but in which the hazardous liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment, (2) in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation, but which might become hazardous through failure or abnormal operation of the ventilating equipment, or (3) which are adjacent to Class I, Division 1 locations, and to which hazardous concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided.

This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used, but which, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of hazardous material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that should receive consideration in determining the classification and extent of each hazardous area.

Piping without valves, checks, meters and similar devices would not ordinarily be deemed to introduce a hazardous condition even though used for hazardous liquids or gases. Locations used for the storage of hazardous liquids or of liquefied or compressed gases in sealed containers would not normally be considered hazardous unless subject to other hazardous conditions also.

Electrical conduits and their associated enclosures separated from process fluids by a single seal or barrier shall be classed as Division 2 locations if the outside of conduit and enclosures is a nonhazardous area.

ARTICLE 513 — AIRCRAFT HANGARS

513-1. Definition. This occupancy shall include locations used for storage or servicing of aircraft in which gasoline, jet fuels, or other volatile flammable liquids, or flammable gases, are used, but shall not include such locations when used exclusively for aircraft which have never contained such liquids or gases, or which have been drained and properly purged.

513-2. Hazardous Areas. Classification under Article 500.

(a) Any pit or depression below the level of the hangar floor shall be considered to be a Class I, Division I location which shall extend up to said floor level.

(b) The entire area of the hangar including any adjacent and communicating areas not suitably cut off from the hangar shall be considered to be a Class I, Division 2 location up to a level 18 inches above the floor.

(c) The area within 5 feet horizontally from aircraft power plants, aircraft fuel tanks or aircraft structures containing fuel shall be considered to be a Class I, Division 2 hazardous location which shall ex- t .d upward from the floor to a level 5 feet above the upper surface of wings and of engine enclosures.

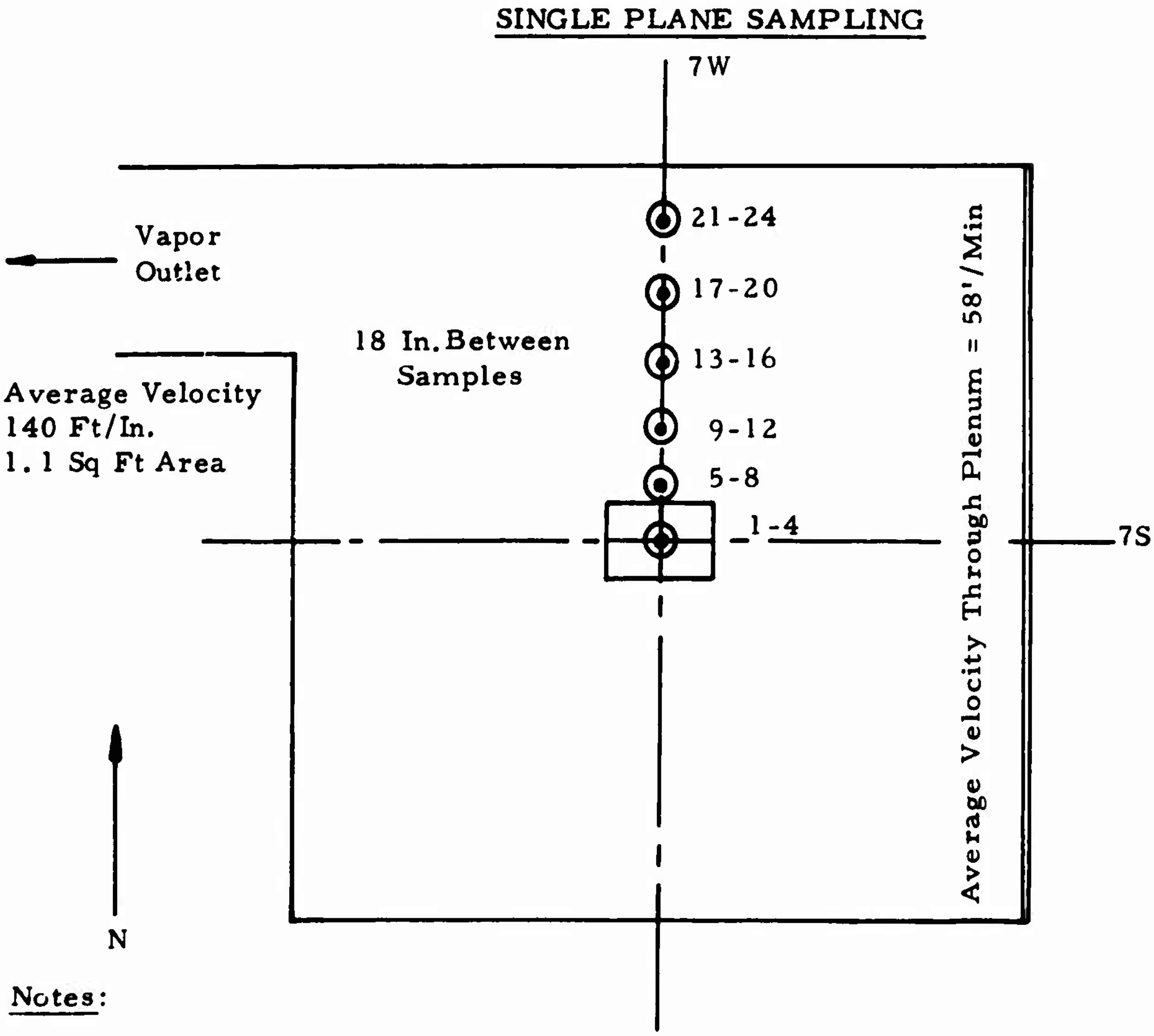
(d) Adjacent areas in which hazardous vapors are not likely to be released such as stock rooms, electrical control rooms, and other similar locations, should not be classed as hazardous when adequately ventilated and when effectively cut off from the hangar itself by walls or partitions.

513-3. Wiring and Equipment in Hazardous Areas. All fixed and portable wiring and equipment which is or may be installed or operated within any of the hazardous locations defined in Section 513-2 shall conform to applicable provisions of Article 501. All wiring installed in or under the hangar floor shall conform to the requirements for Class I, Division I. When such wiring is located in vaults, pits, or ducts, adequate drainage shall be provided, and the wiring shall not be placed within the same compartment with any other service except piped compressed air.

Attachment plugs and receptacles in hazardous locations shall be explosion-proof or shall be so designed that they cannot be energized while the connections are being made or broken.

APPENDIX II

SAMPLING CONFIGURATIONS



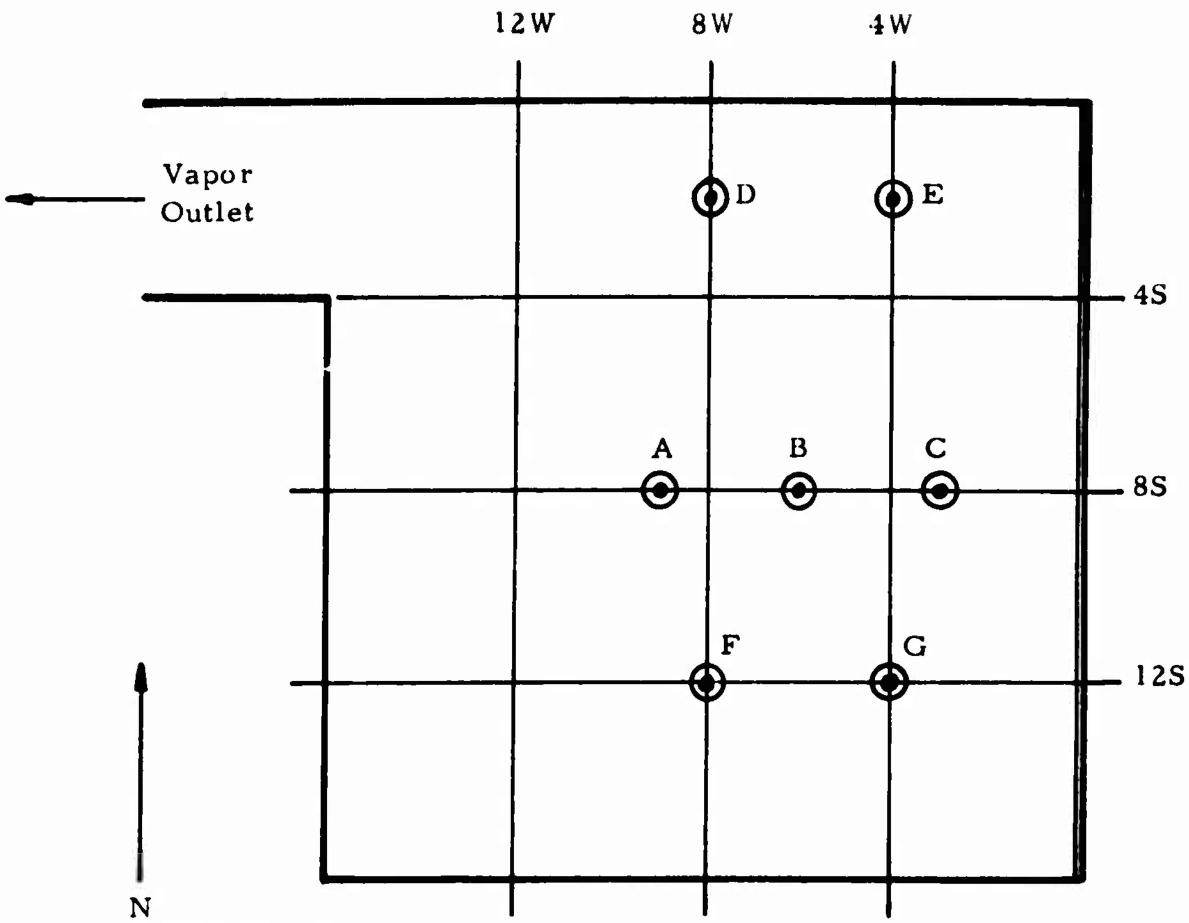
Notes:

1. Sample points numbered upward from the floor 4, 8, 12, 16 in. levels.

2. For Test No. 4A, pan was upended to direct contents toward east wall.

3. For Test No. 4B, blowers were turned on. Average velocities shown refer only to this test.

FIGURE II-1. SAMPLE CONFIGURATION NO. 1 FOR TESTS 1 THROUGH 5



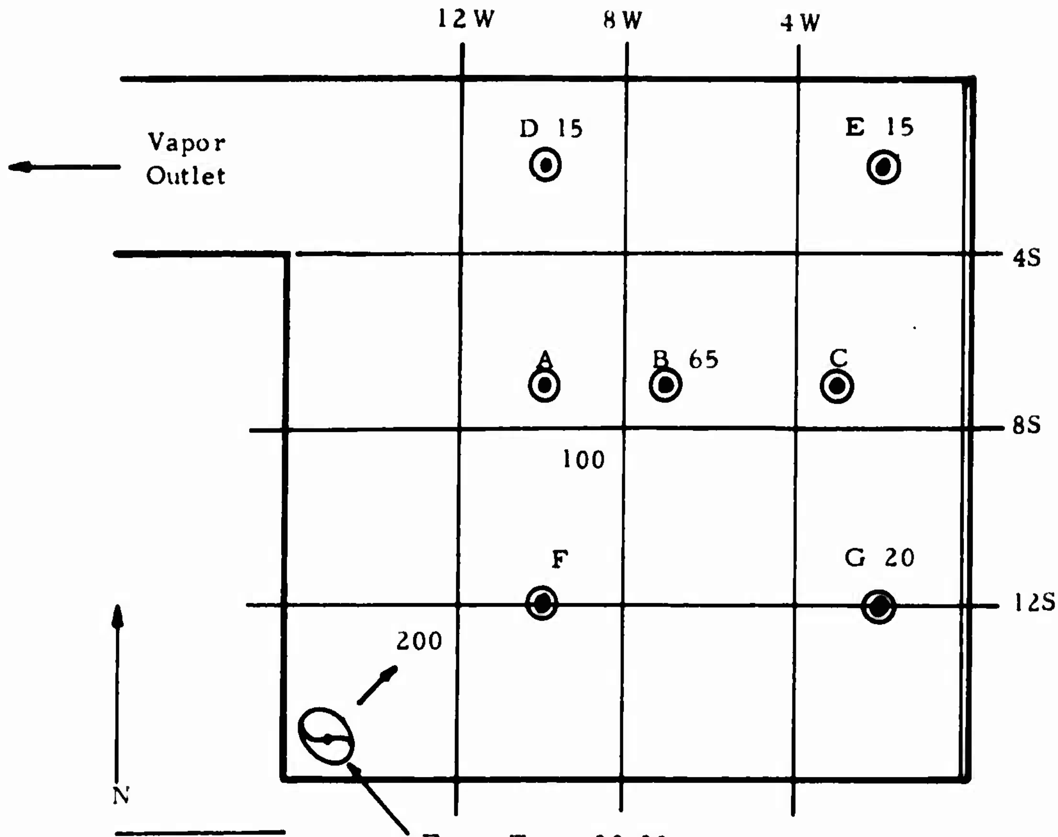
No. 24 Outdoors

Note:

Grid lines are at 4-ft intervals.

Point No.	Location	Elevation, in.	Point No.	Location	Elevation, in.
1	C	96	13	E	2
2	A	96	14	D	2
3	B	96	15	C	2
4	B	48	16	F	2
5	E	48	17	G	2
6	D	48	18	G	12
7	D	18	19	F	12
8	E	18	20	F	18
9	B	18	21	G	18
10	B	12	22	G	48
11	E	12	23	F	48
12	D	12	24	Outdoors	

FIGURE II-2. SAMPLE CONFIGURATION NO. 2
FOR TESTS 6 THROUGH 11



No. 24 Outdoors

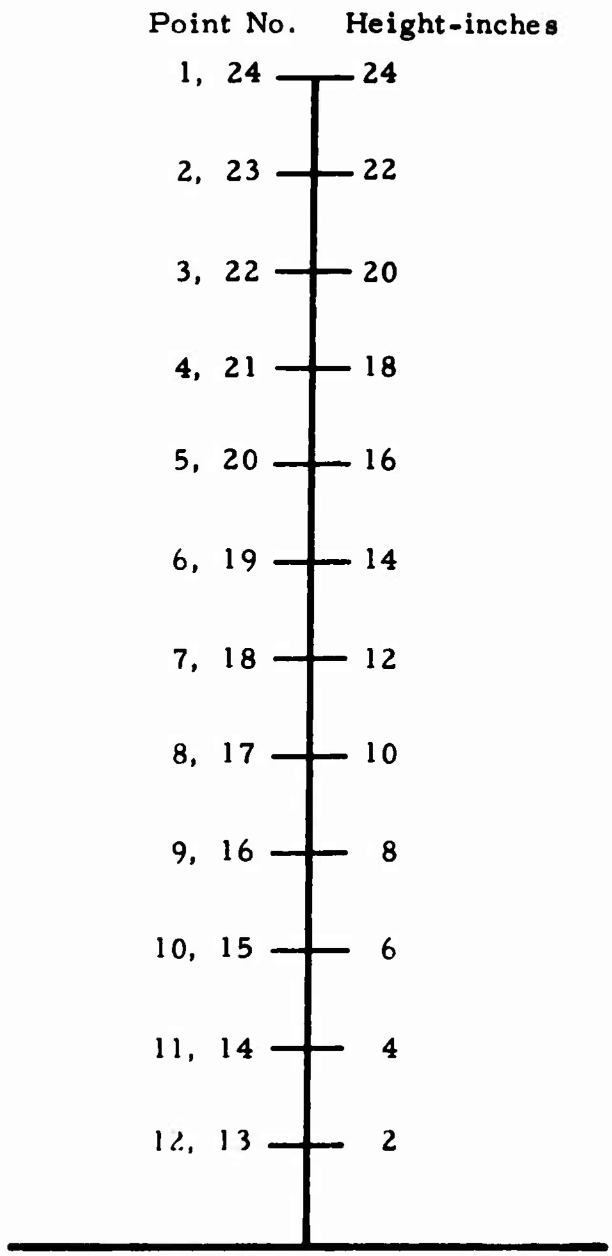
Note:

1. Sample configuration No. 3 differs from No. 2 only in wider spacing between D-E and F-G.

2. Grid lines are at 4-ft intervals. Numbers are air velocities in ft/min with fan at 13W, 13S operating during parts of tests 30-33.

Point No.	Location	Elevation, in.	Point No.	Location	Elevation, in.
1	C	96	13	E	2
2	A	96	14	D	2
3	B	96	15	B	2
4	B	48	16	F	2
5	E	48	17	G	2
6	D	48	18	G	12
7	D	18	19	F	12
8	E	18	20	F	18
9	B	18	21	G	18
10	B	12	22	G	48
11	E	12	23	F	48
12	D	12	24	Outside	

FIGURE II-3. SAMPLE CONFIGURATION NO. 3
FOR TESTS 12 THROUGH 22

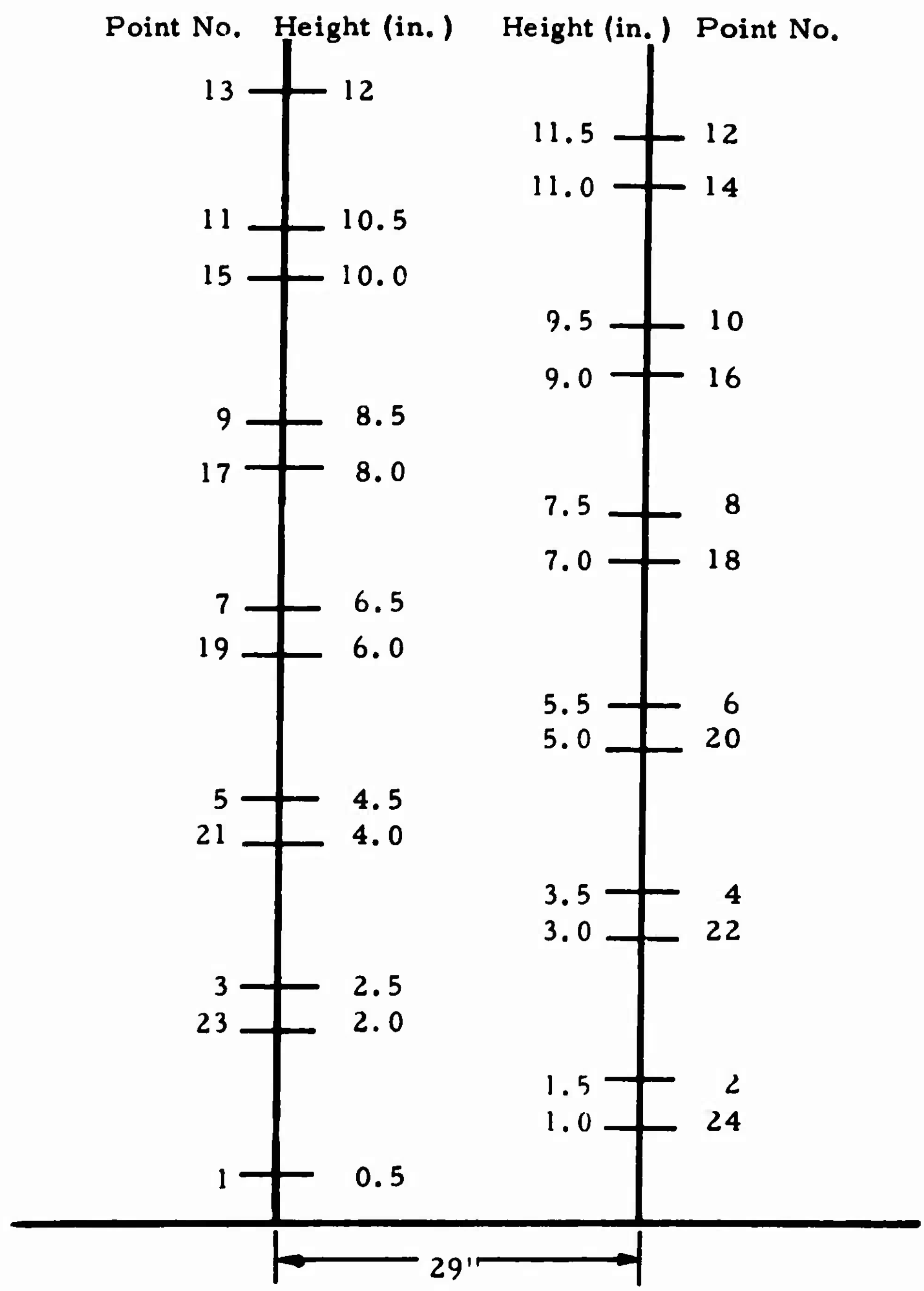


Tests 23 and 29

Note:

All sampling at center of room (7W, 7S). For tests 23 and 29, sample points are alternated 90° apart to reduce effect of sample air currents on vapor layer buildup.

FIGURE II-4. VERTICAL PROFILE-SAMPLE-CONFIGURATION NO. 4 FOR TEST NOS. 23 & 29



Note:

Consecutive sampling points are separated 29 inches horizontally to minimize effects on vapor environment.

FIGURE II-5. VERTICAL PROFILE SAMPLINGS CONFIGURATION NO. 5 FOR TESTS NOS. 34-37

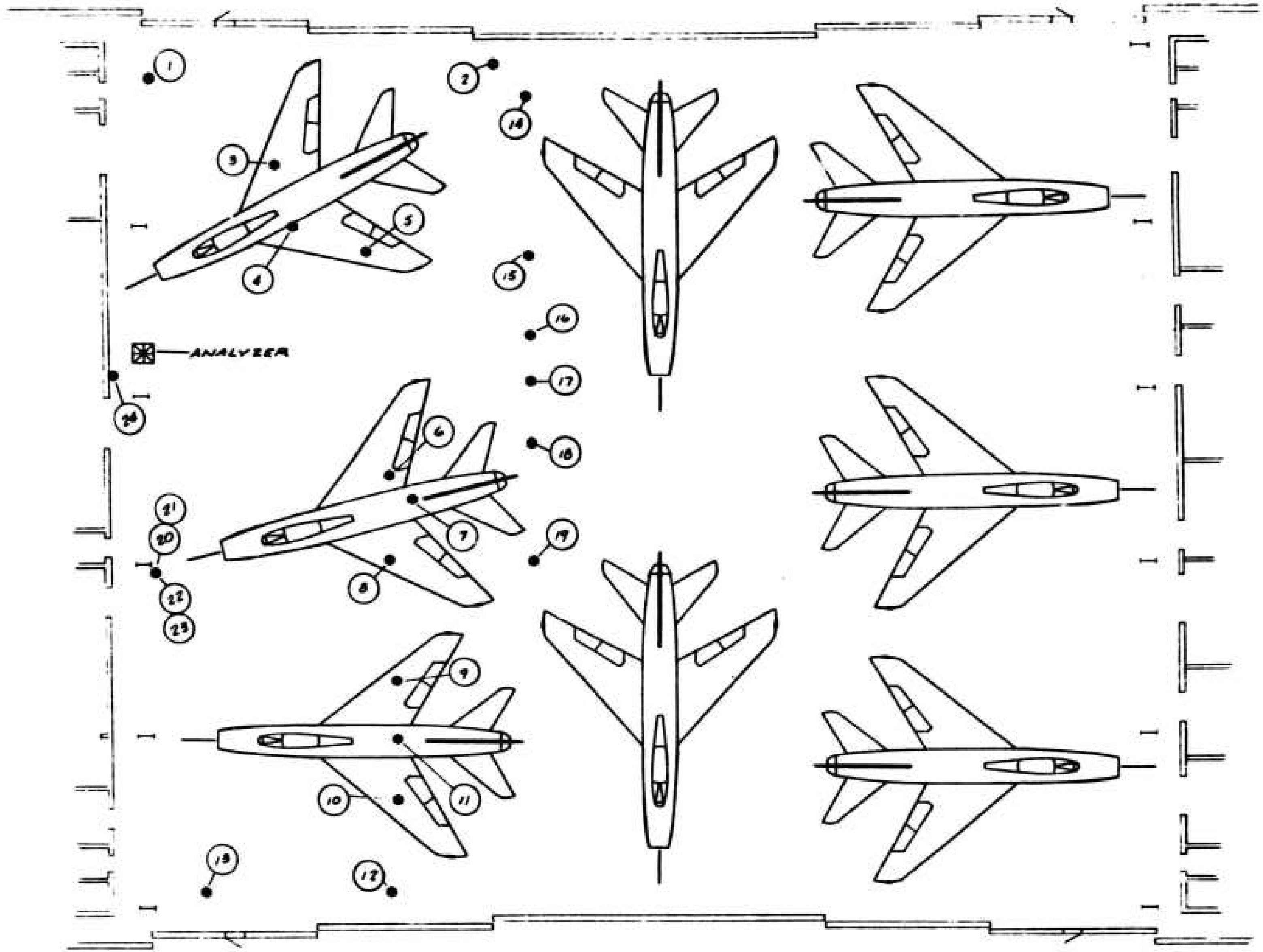


FIGURE II-6. SAMPLING CONFIGURATION FOR KELLY AFB TESTS 24 AND 25

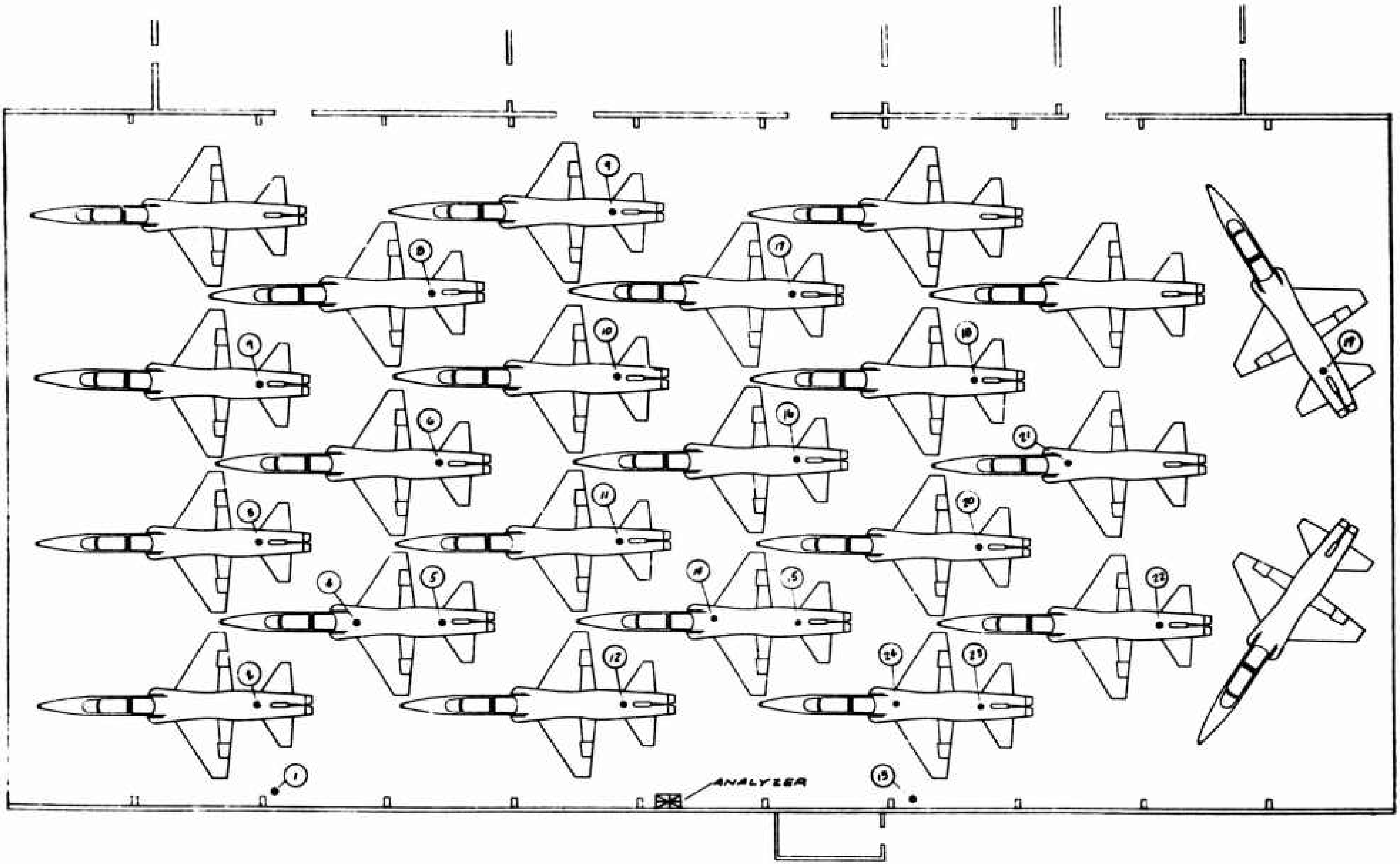


FIGURE II-7 SAMPLING CONFIGURATION FOR RANDOLPH AFB TEST 26

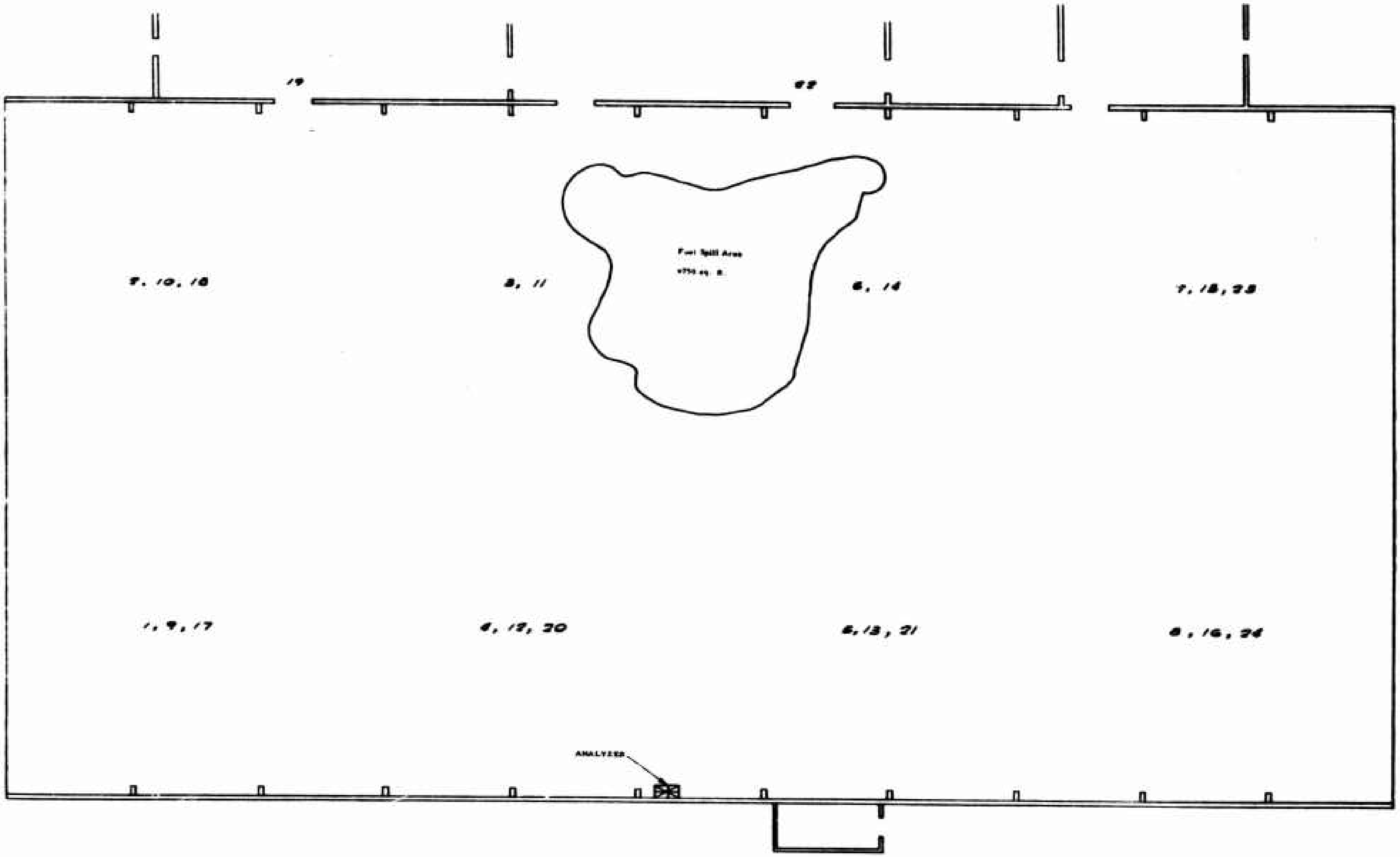


FIGURE II 8. SAMPLING CONFIGURATION FOR RANDOLPH AFB TEST 27

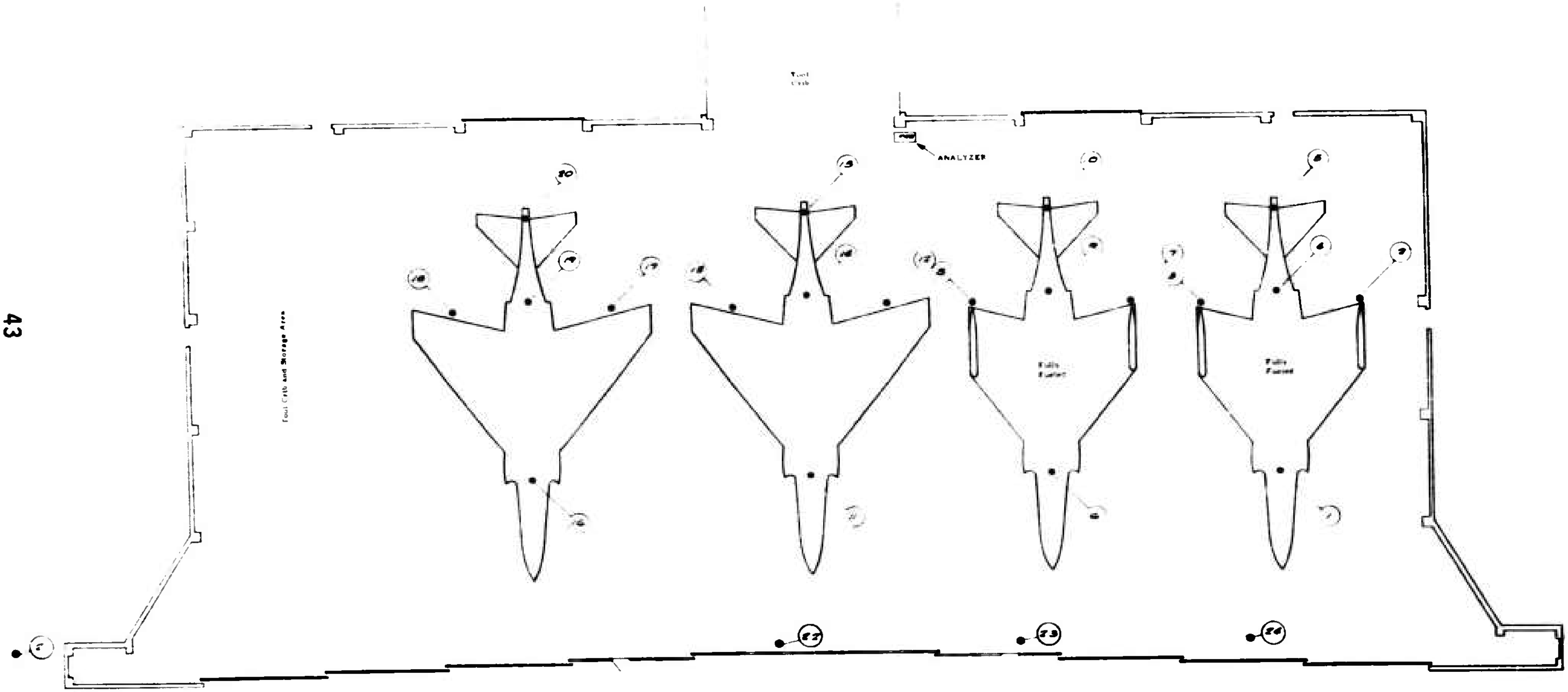


FIGURE II 9. SAMPLING CONFIGURATION FOR BERGSTROM AFB TEST 28

APPENDIX III

PLOTS OF THE TEST INFORMATION

ILLUSTRATIONS

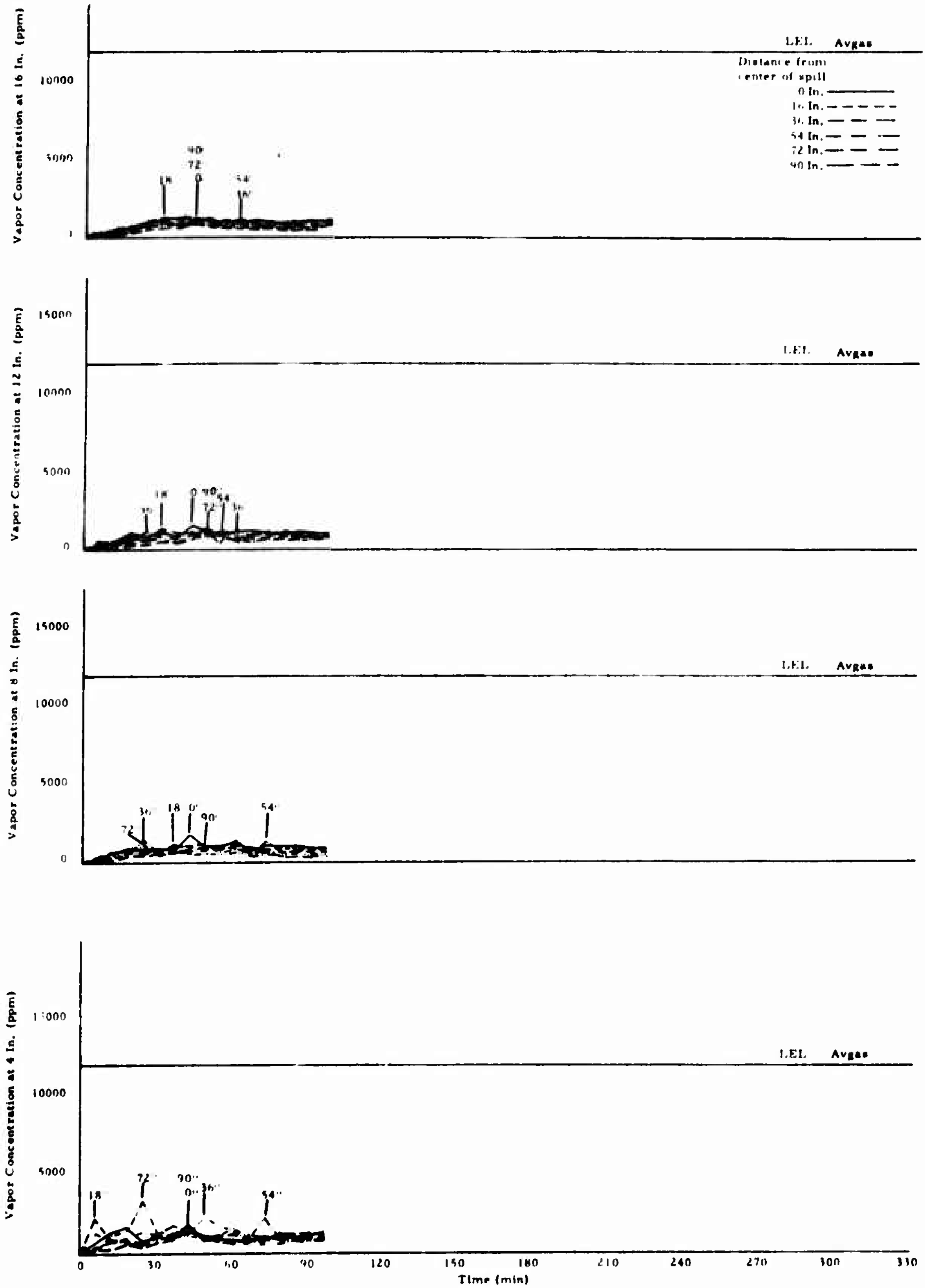


FIGURE III-1. TEST NO. 1 - ONE GALLON AVGAS IN A 2' x 3' PAN

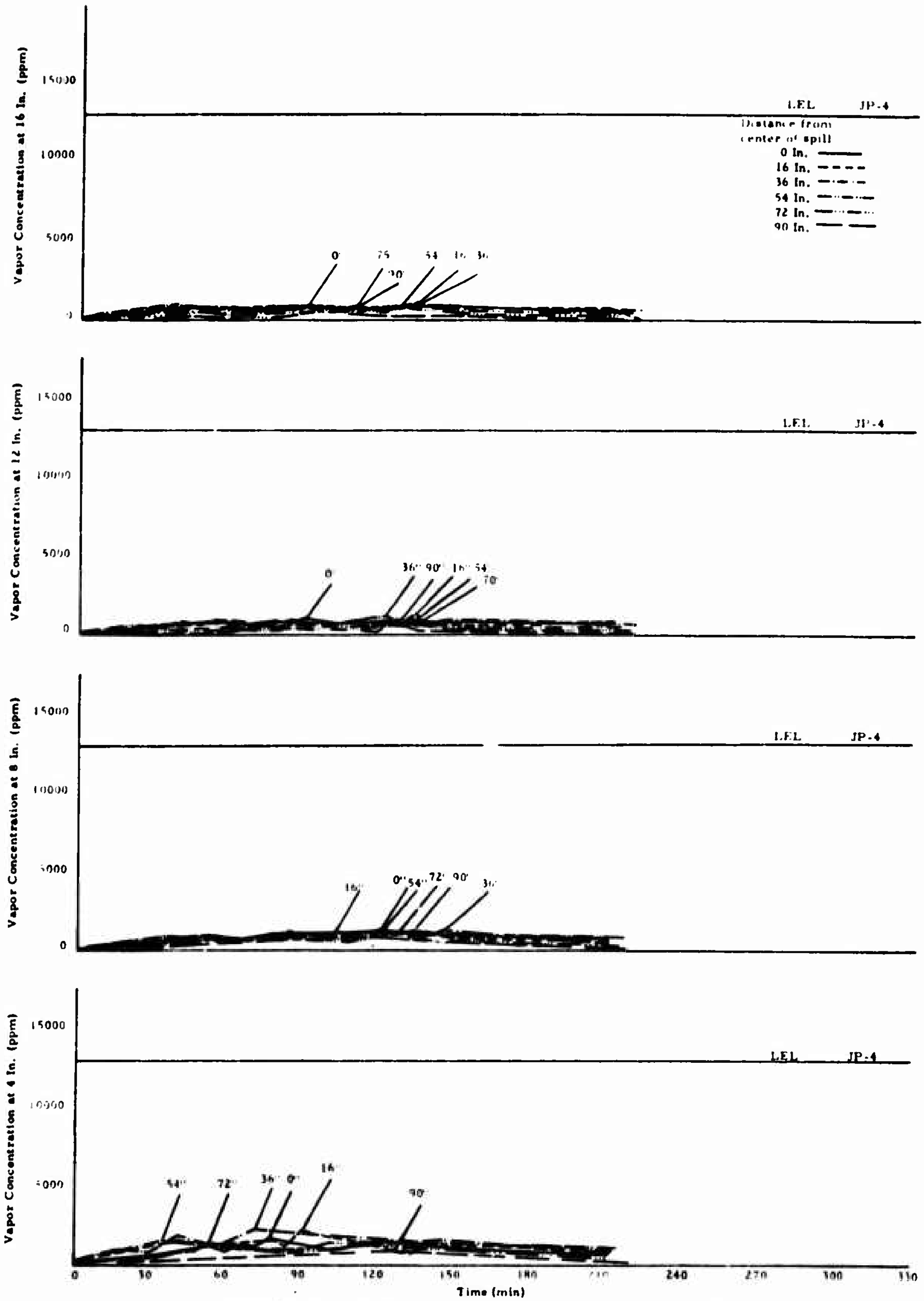


FIGURE III-2. TEST NO. 2 ONE GALLON OF JP-4 IN A 2' x 3' PAN

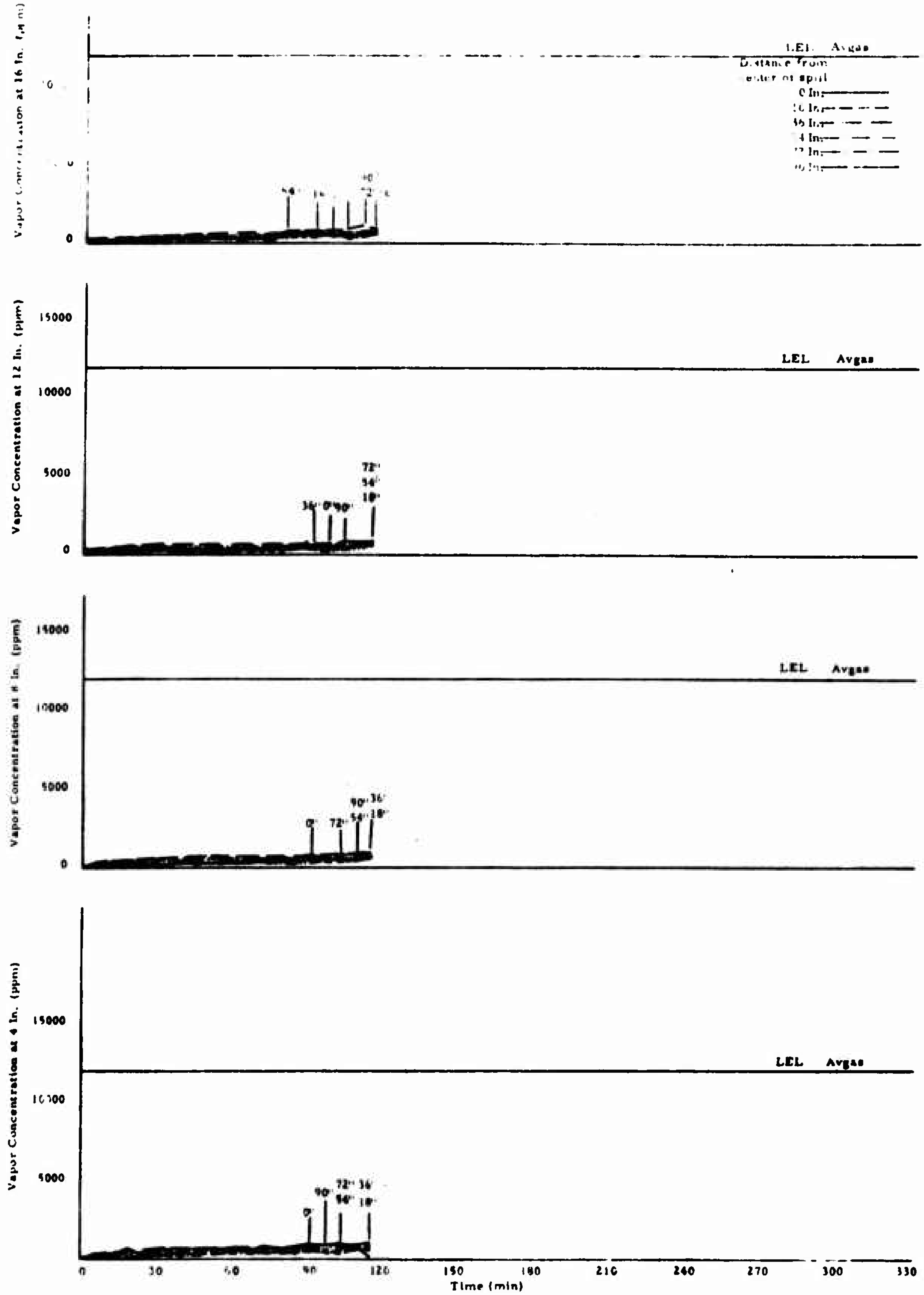


FIGURE III-3. TEST NO. 3–TWO GALLONS AVGAS IN A 2' x 3' PAN

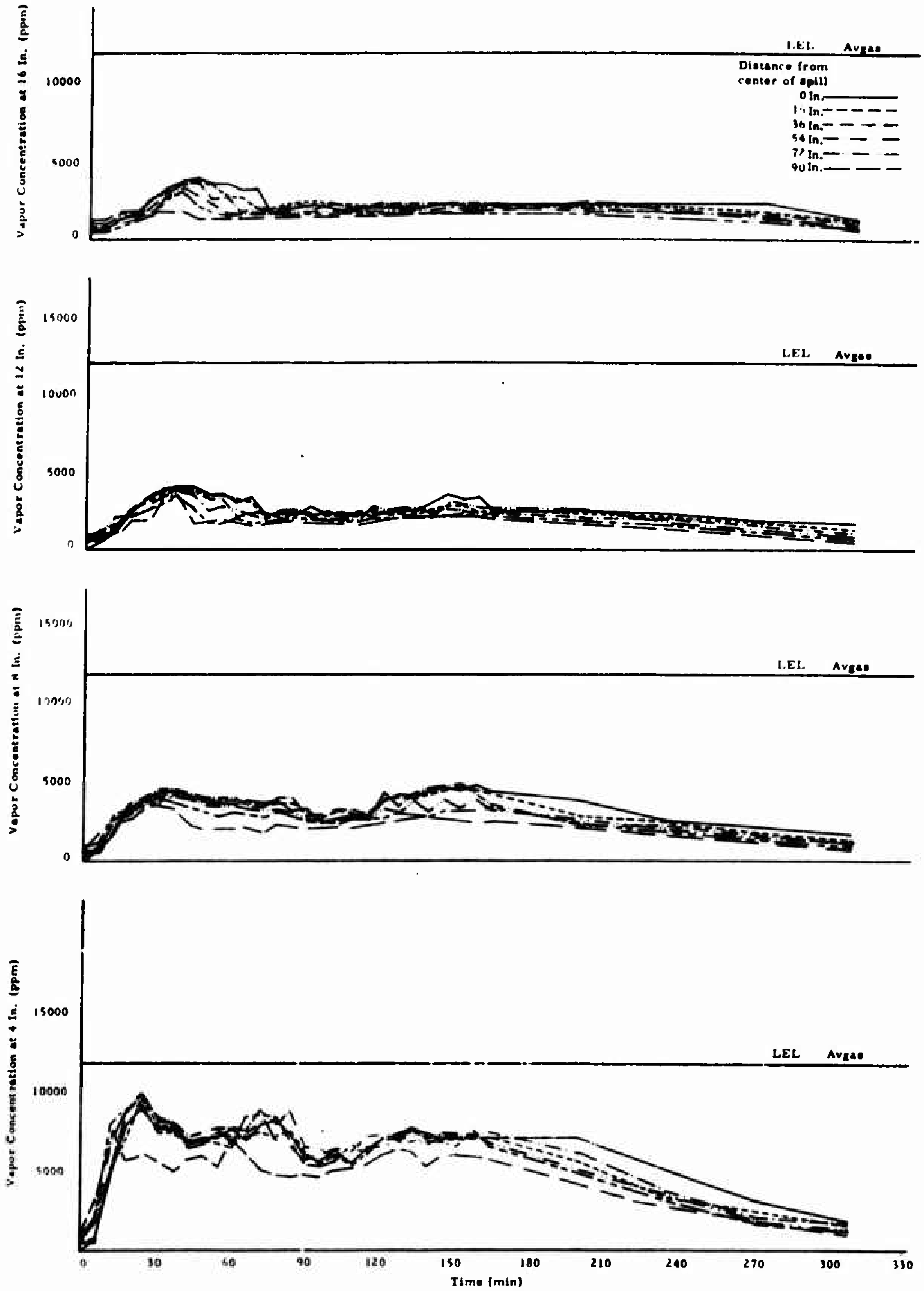


FIGURE III-4A. TEST NO. 4A–FUEL FROM TEST 3 SPILLED ON THE FLOOR

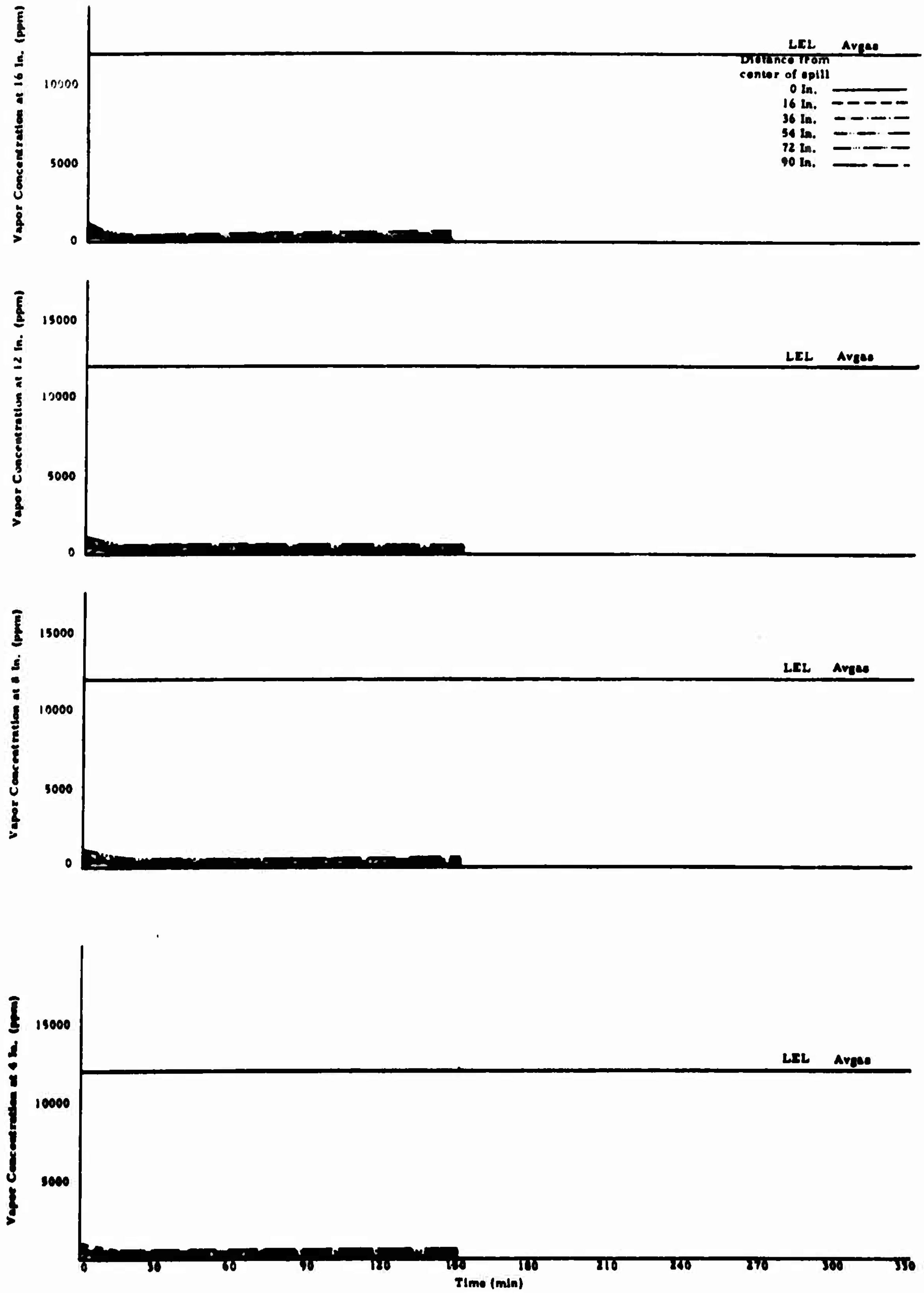


FIGURE III-4B. TEST NO. 4B–TWO GALLONS AVGAS SPILL IN CENTER OF ROOM WITH BLOWERS ON

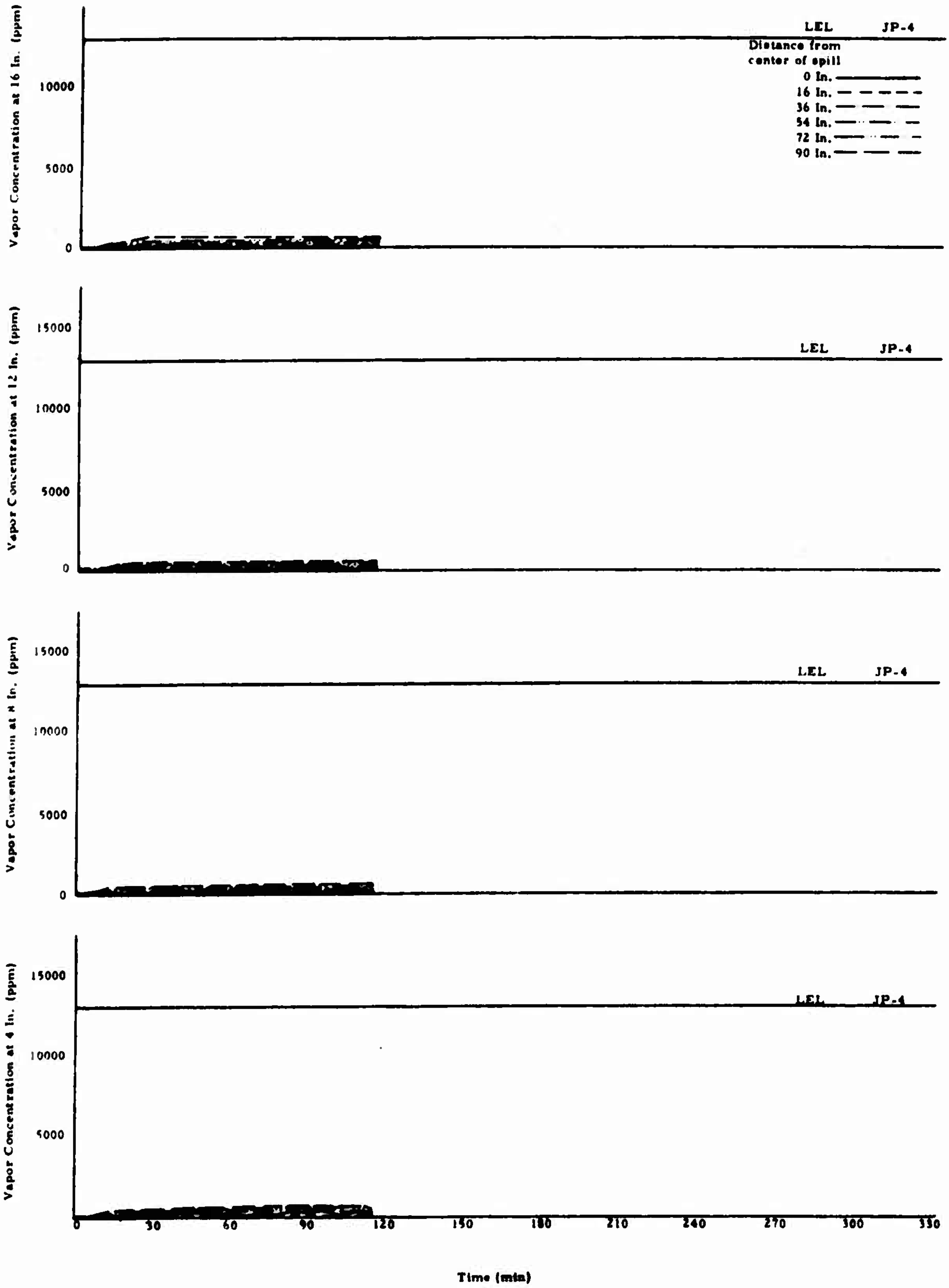


FIGURE III-5. TEST NO. 5 – TWO GALLONS JP-4 IN A 2' × 3' PAN

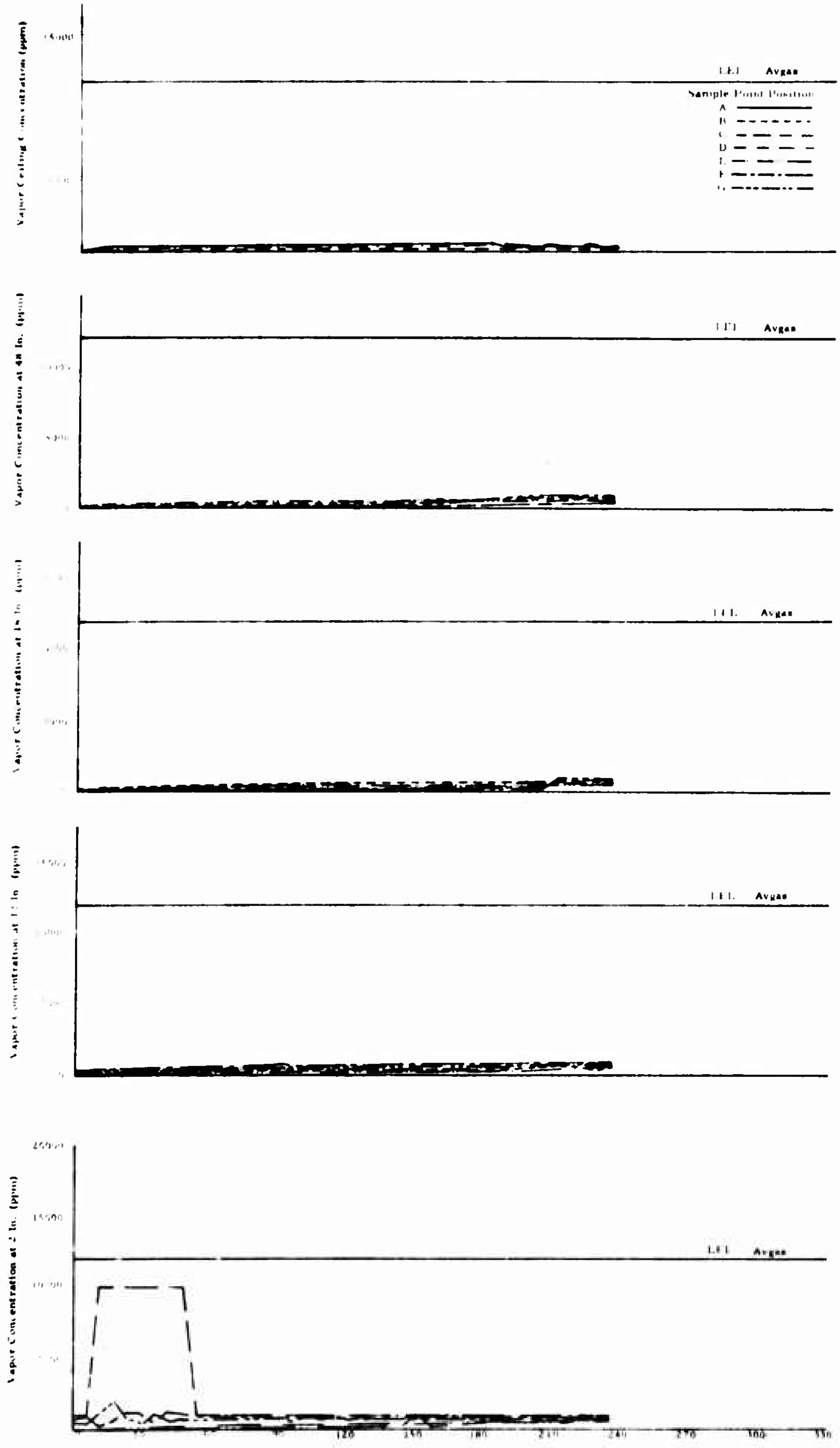


FIGURE III-6. TEST NO. 6 TWO GALLONS OF AVGAS IN A 24" x 30" x 2" PAN

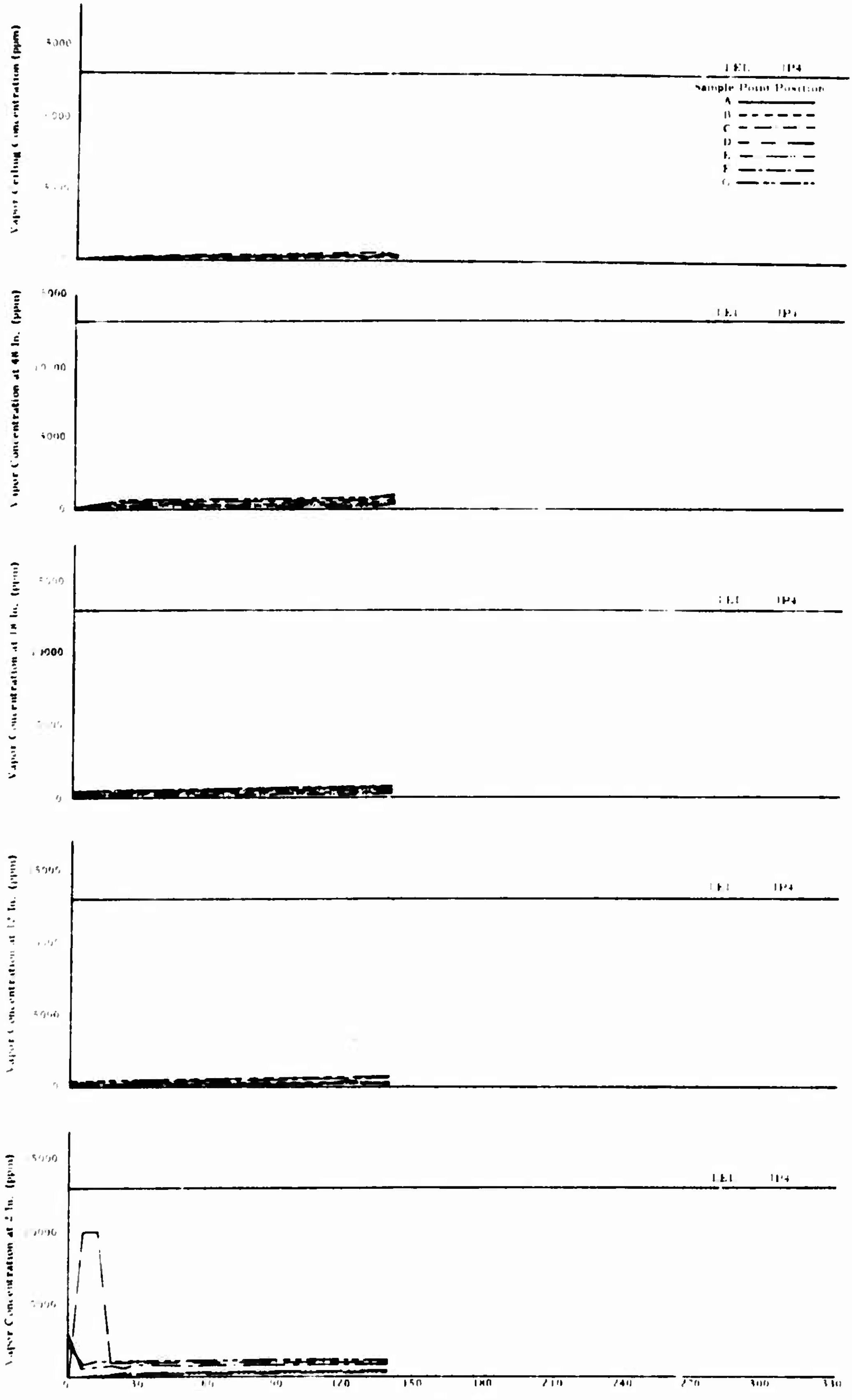


FIGURE III-7. TEST NO. 7 TWO GALLONS OF JP-4 IN A 24" x 30" x 2" PAN

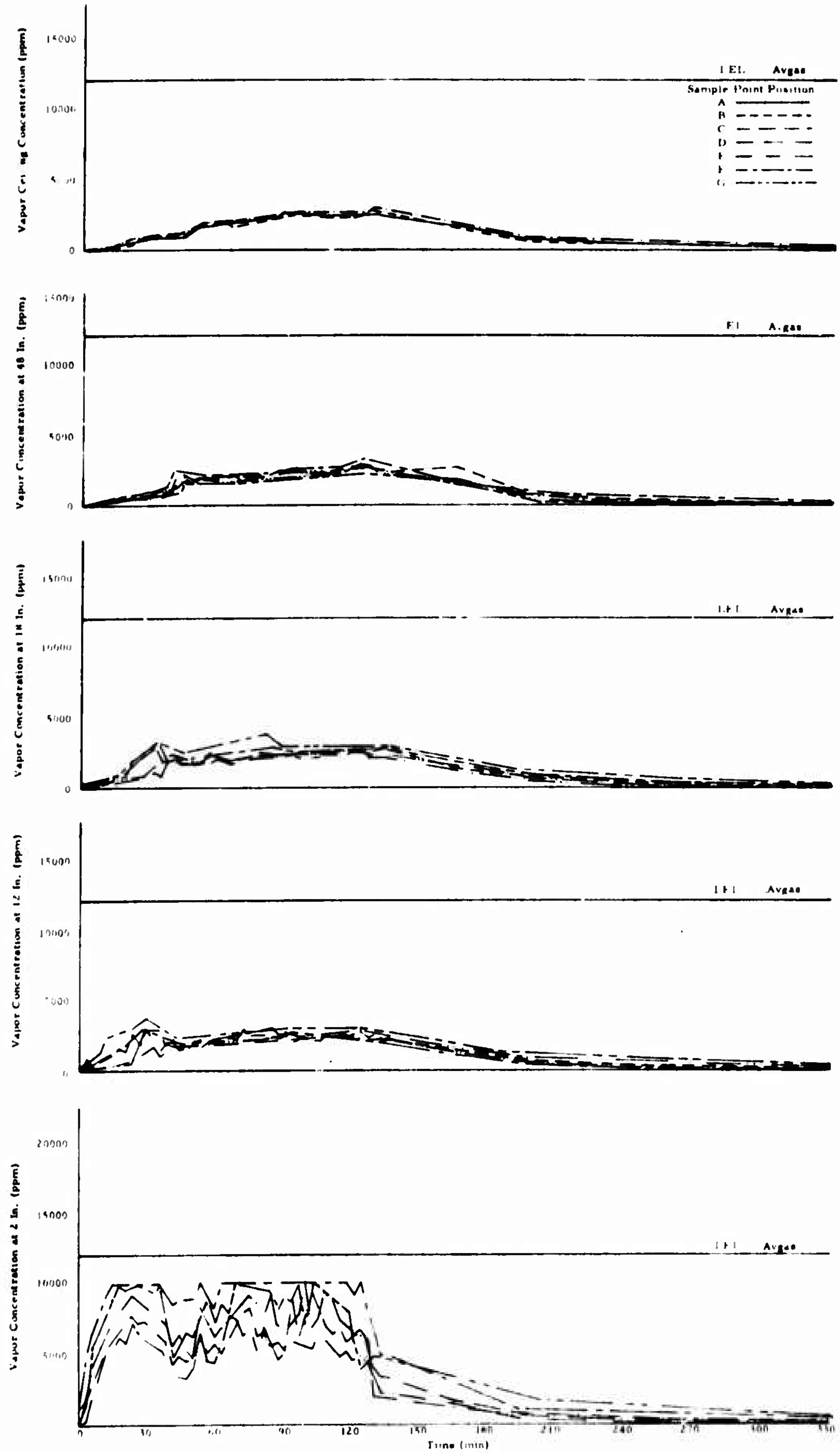


FIGURE III-8. TEST NO. 8 – TWO GALLONS OF AVGAS IN DRIP TEST

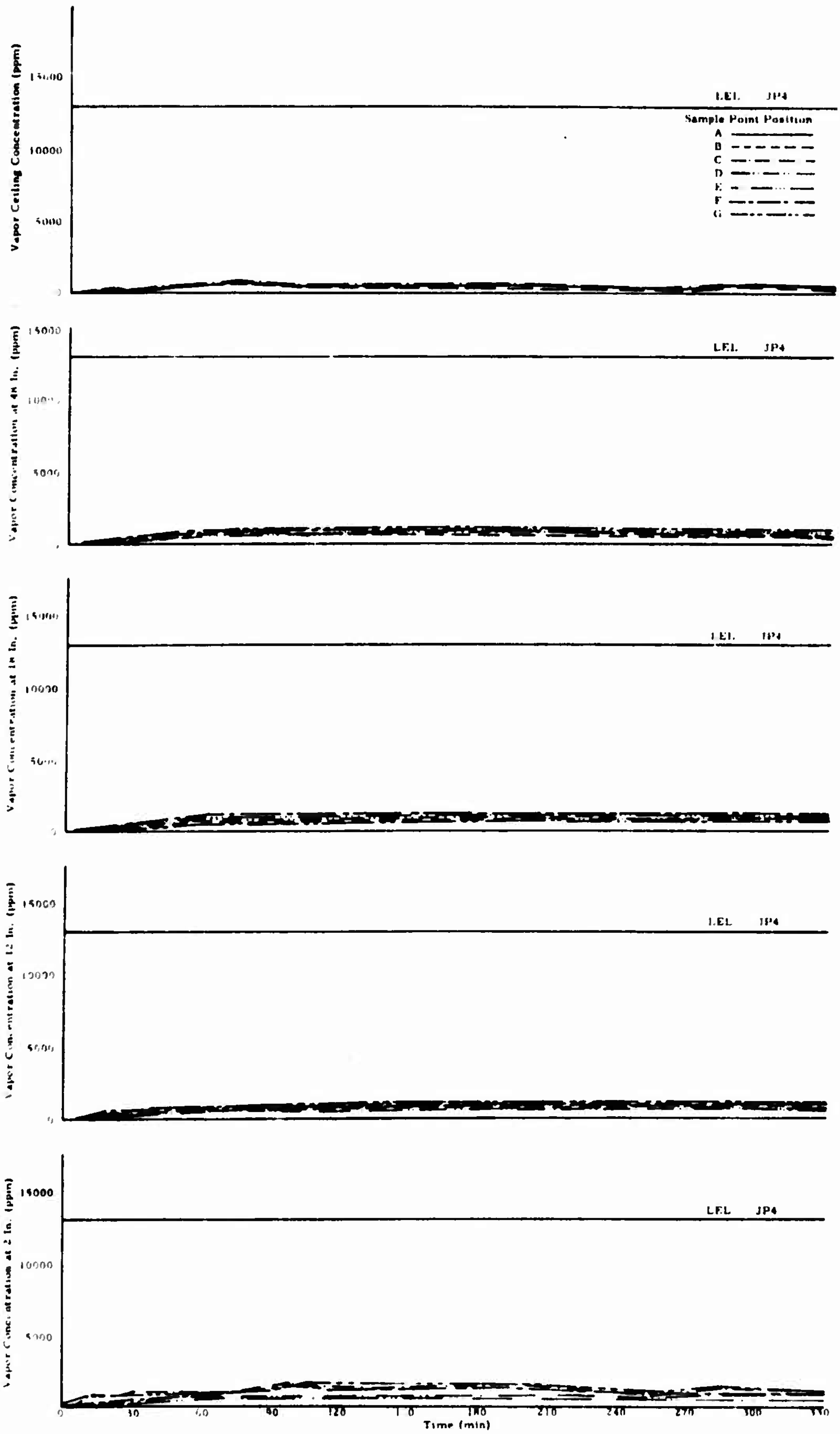


FIGURE III-9. TEST NO. 9–TWO GALLONS OF JP-4 IN DRIP TEST

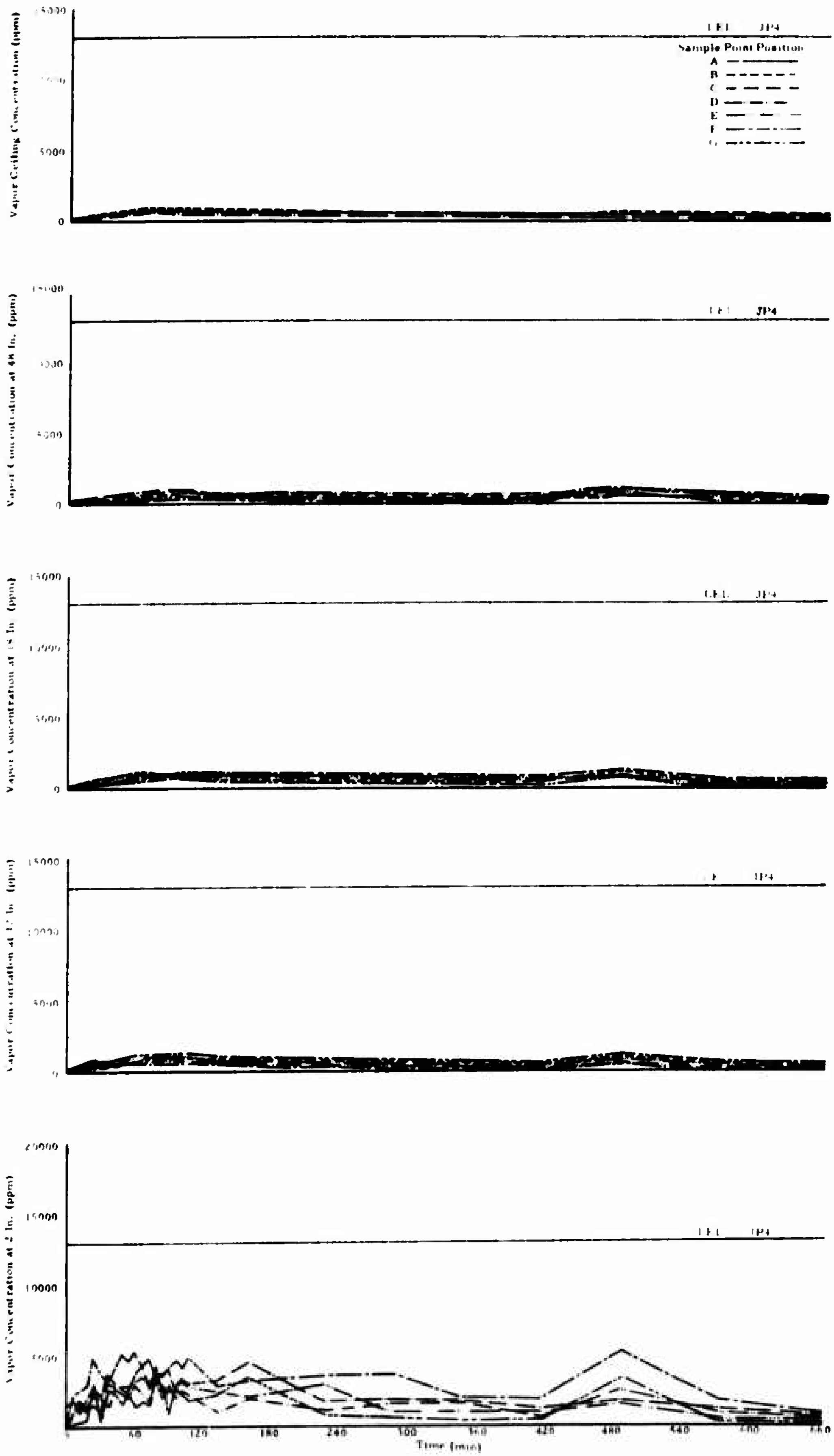


FIGURE III-10. TEST NO. 10–FOUR GALLONS OF JP-4 IN DRIP TEST

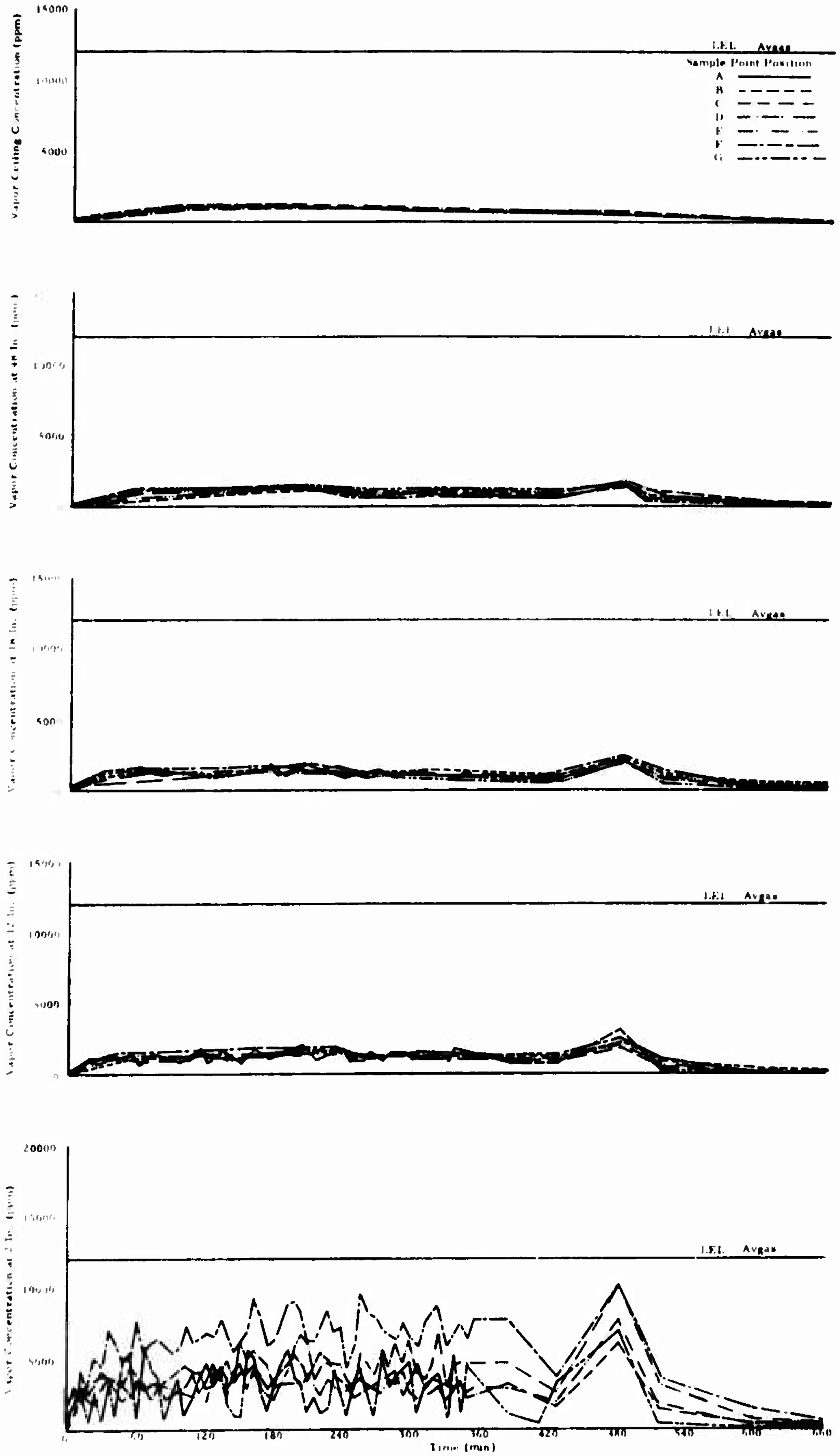


FIGURE III-11. TEST NO. 11 – FOUR GALLONS OF AVGAS IN DRIP TEST

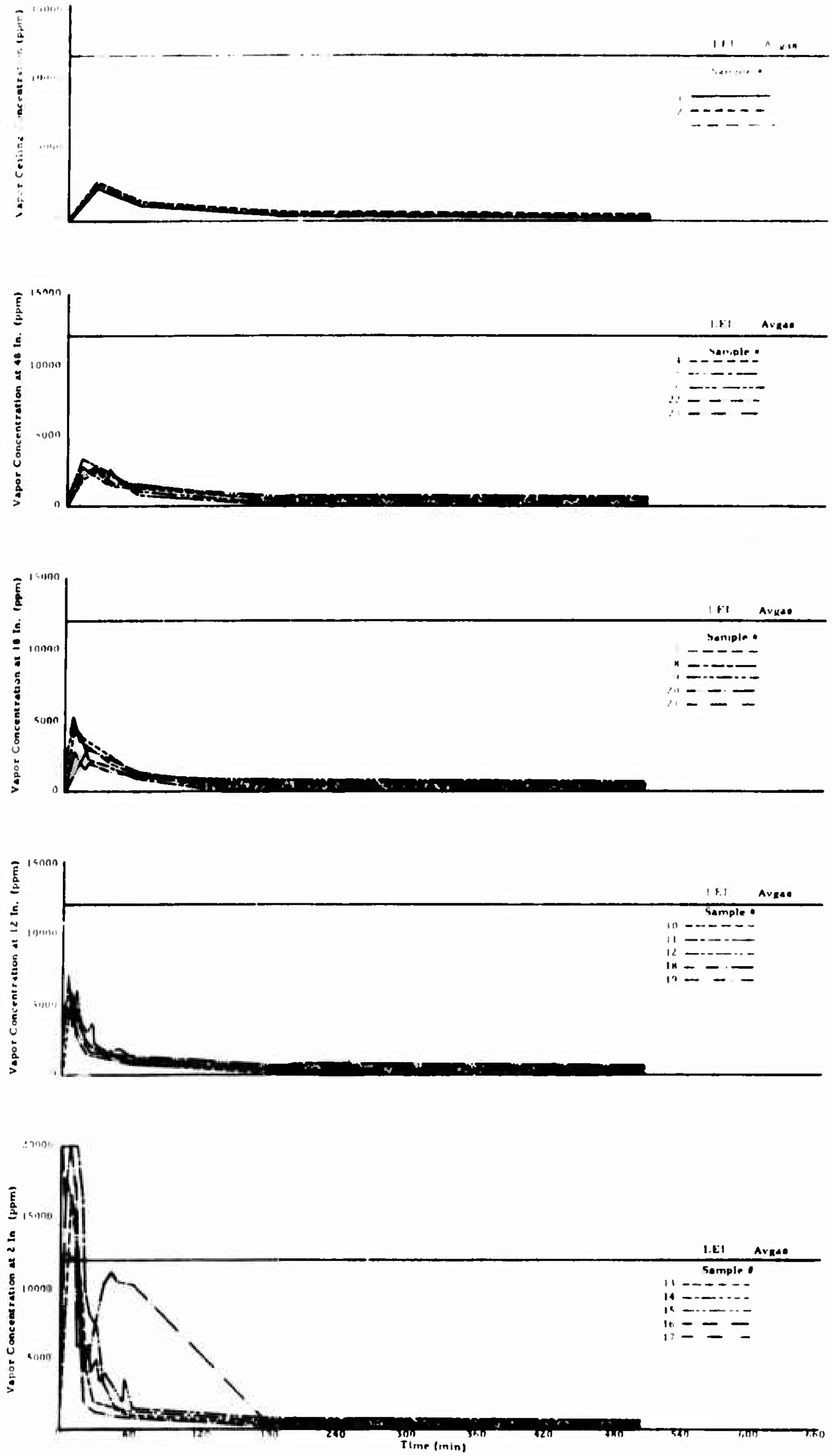


FIGURE III-12. TEST NO. 12 FOUR GALLONS OF AVGAS IN A SPILL TEST

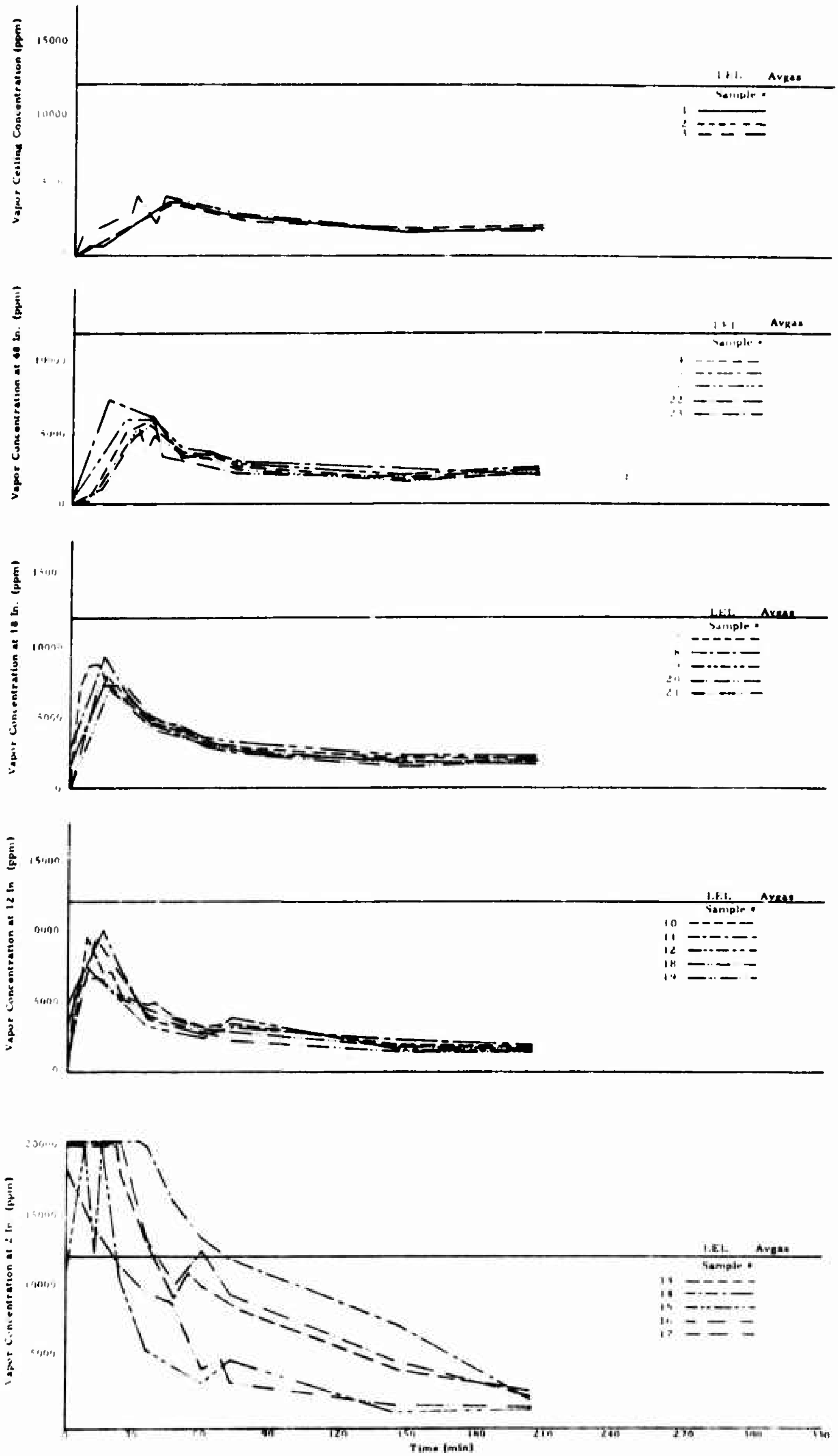


FIGURE III-13. TEST NO. 13 FOUR GALLONS OF AVGAS IN A SPILL TEST

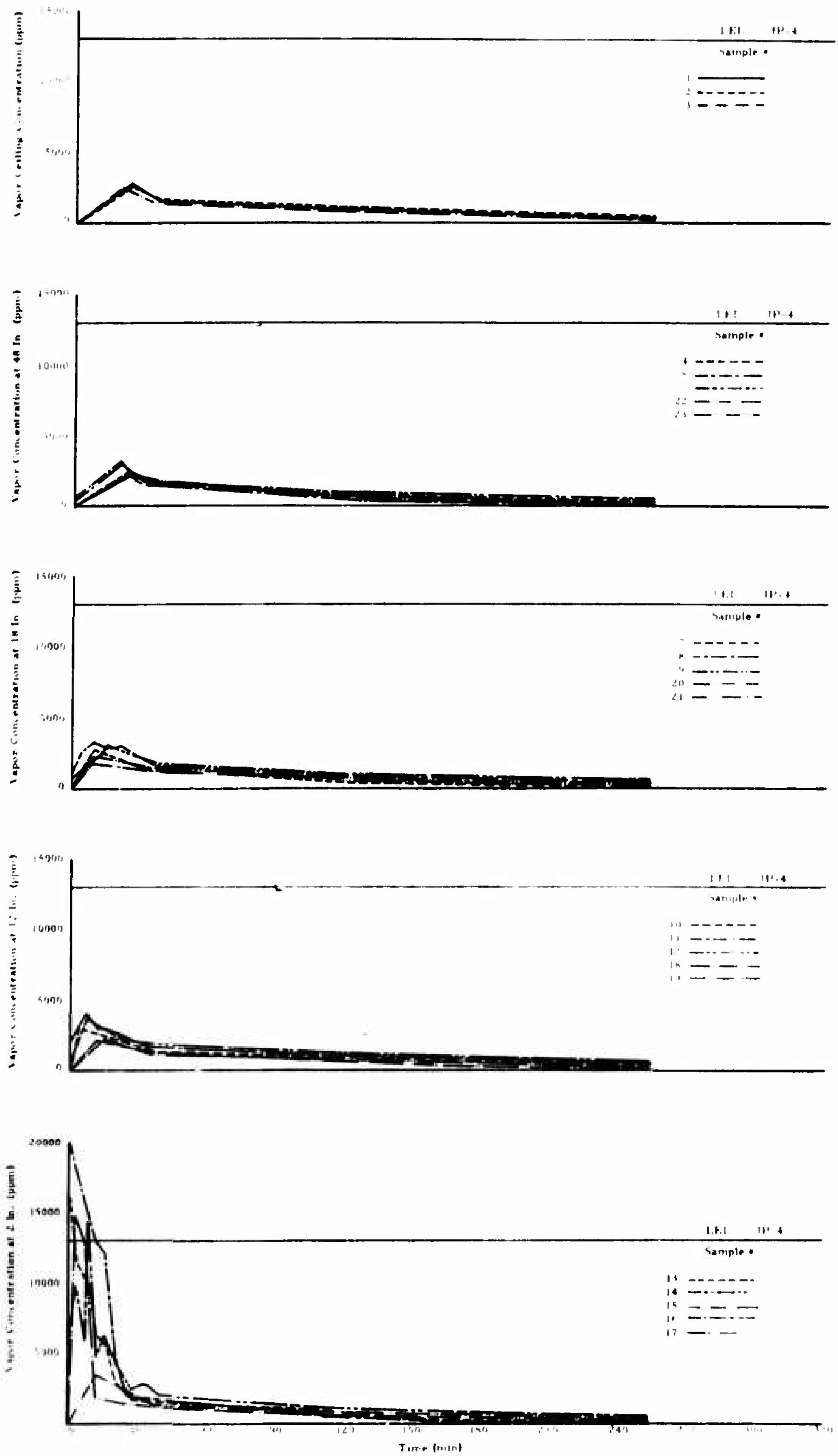


FIGURE III-14. TEST NO. 14 – FOUR GALLONS OF JP-4 IN A SPILL TEST

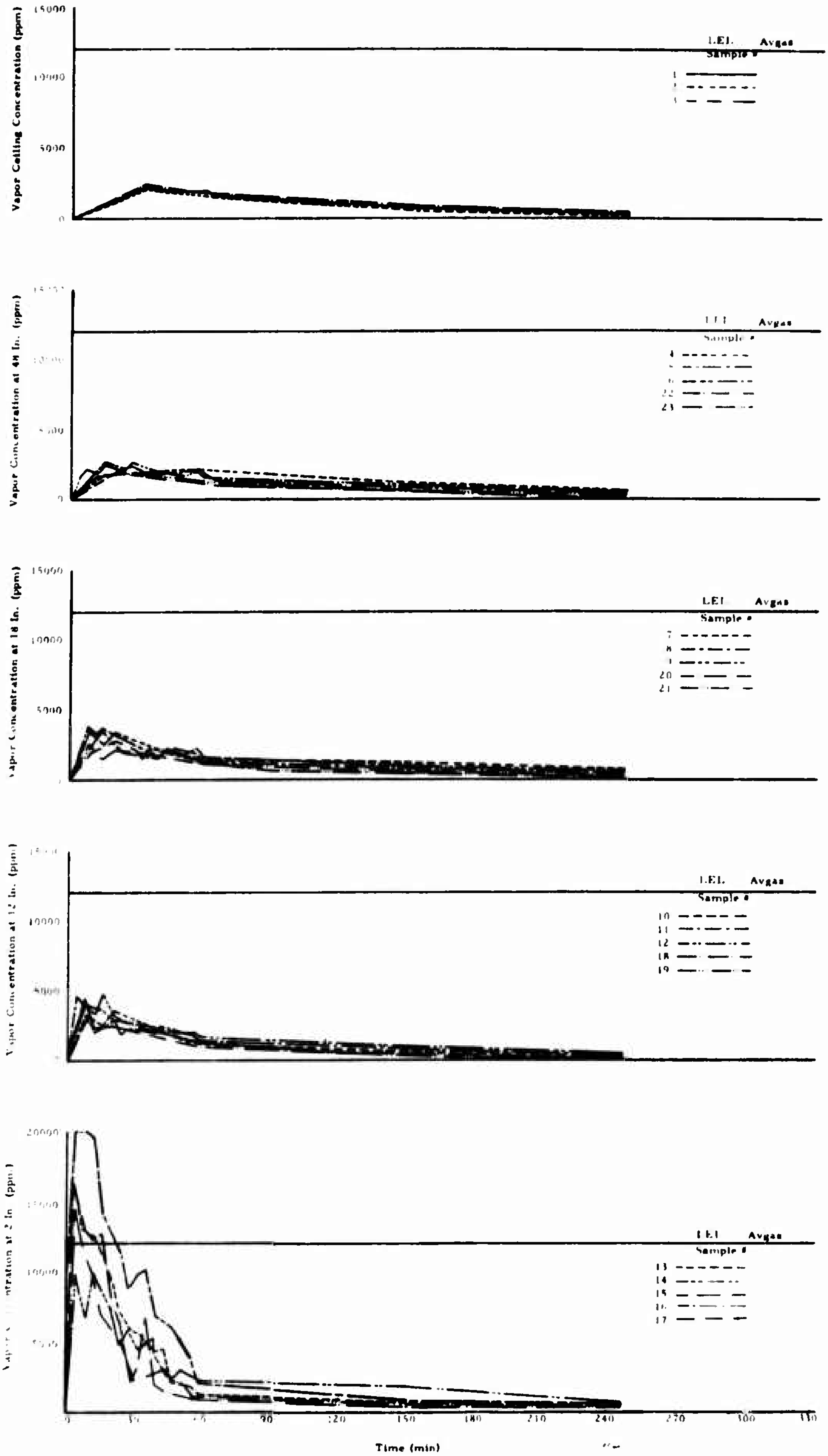


FIGURE III-15. TEST NO. 15—FOUR GALLONS OF AVGAS IN A SPILL TEST

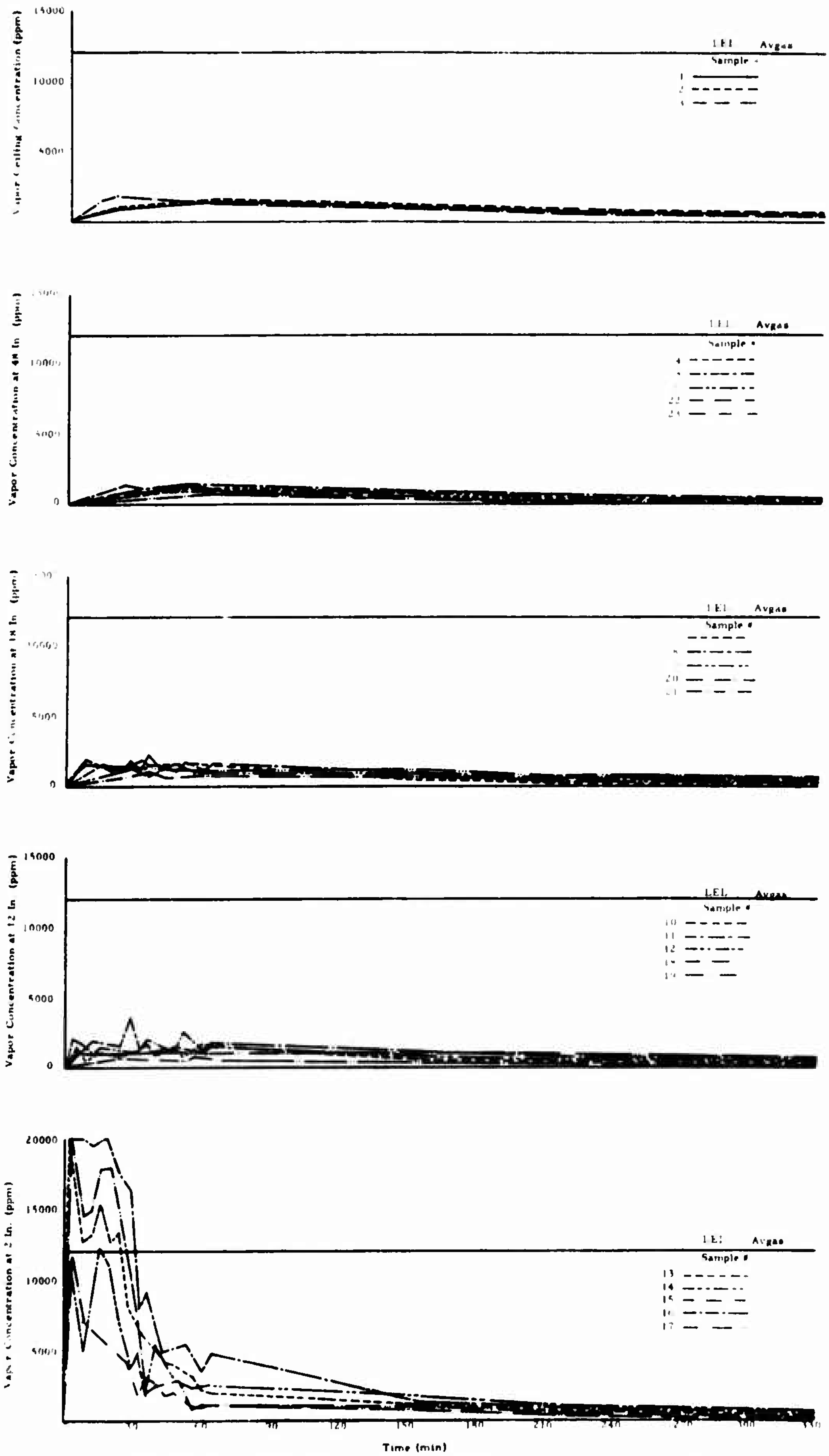


FIGURE III-16. TEST NO. 16 –TEN GALLONS OF AVGAS IN A SPILL TEST

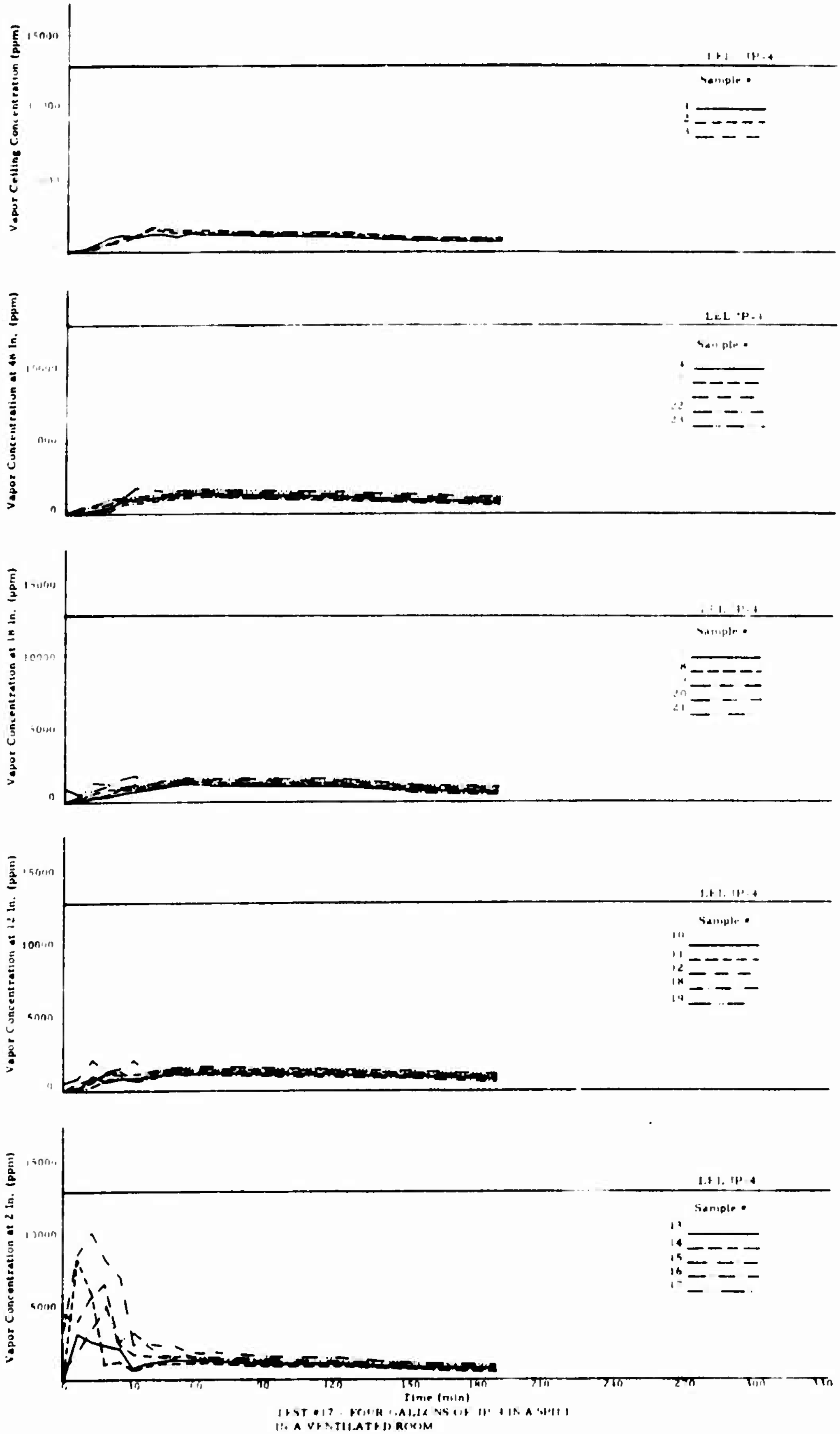


FIGURE III-17. TEST NO. 17—FOUR GALLONS OF JP-4 IN A SPILL TEST

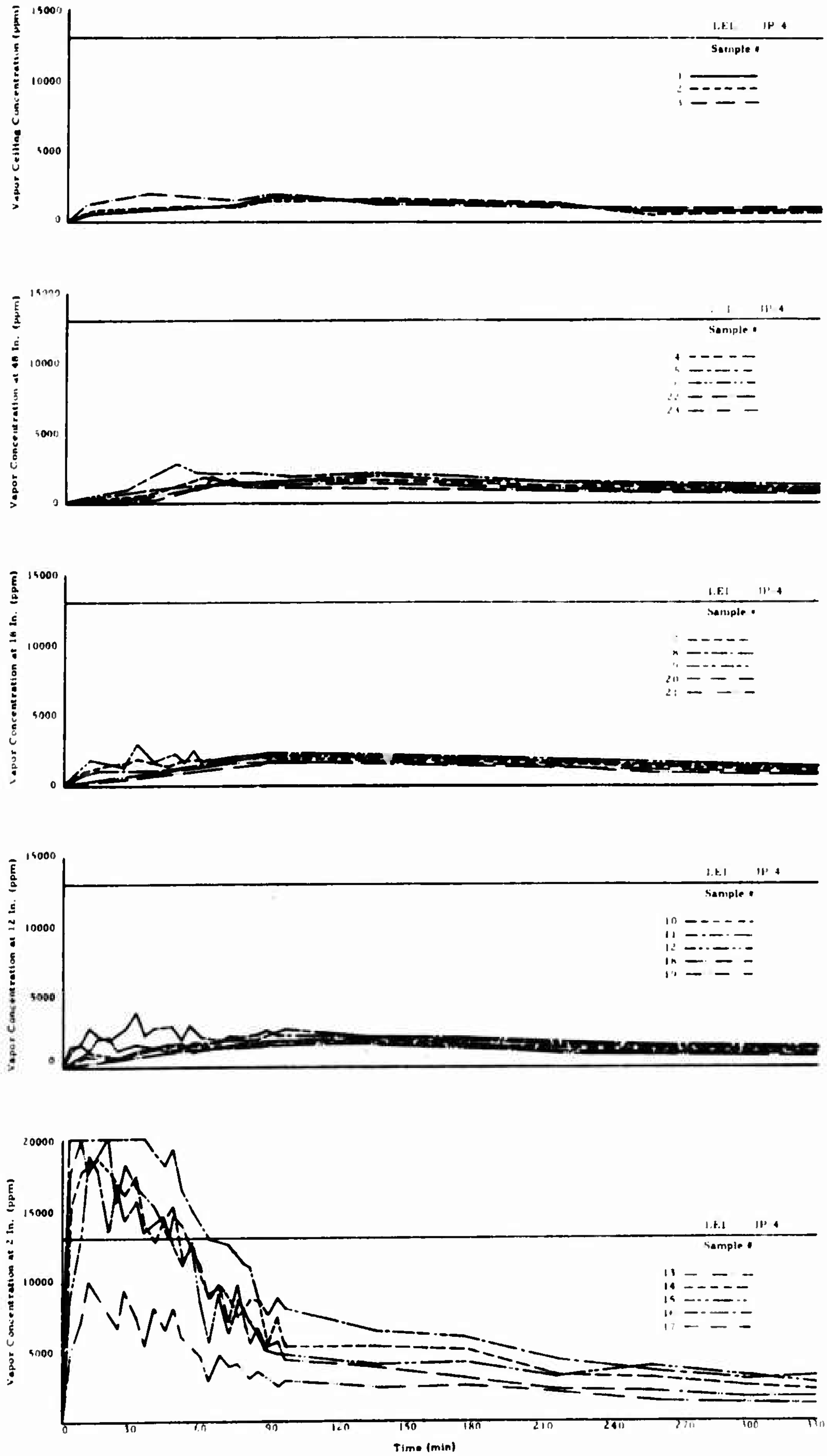


FIGURE III-18. TEST NO. 18–TEN GALLONS OF JP-4 IN A SPILL TEST

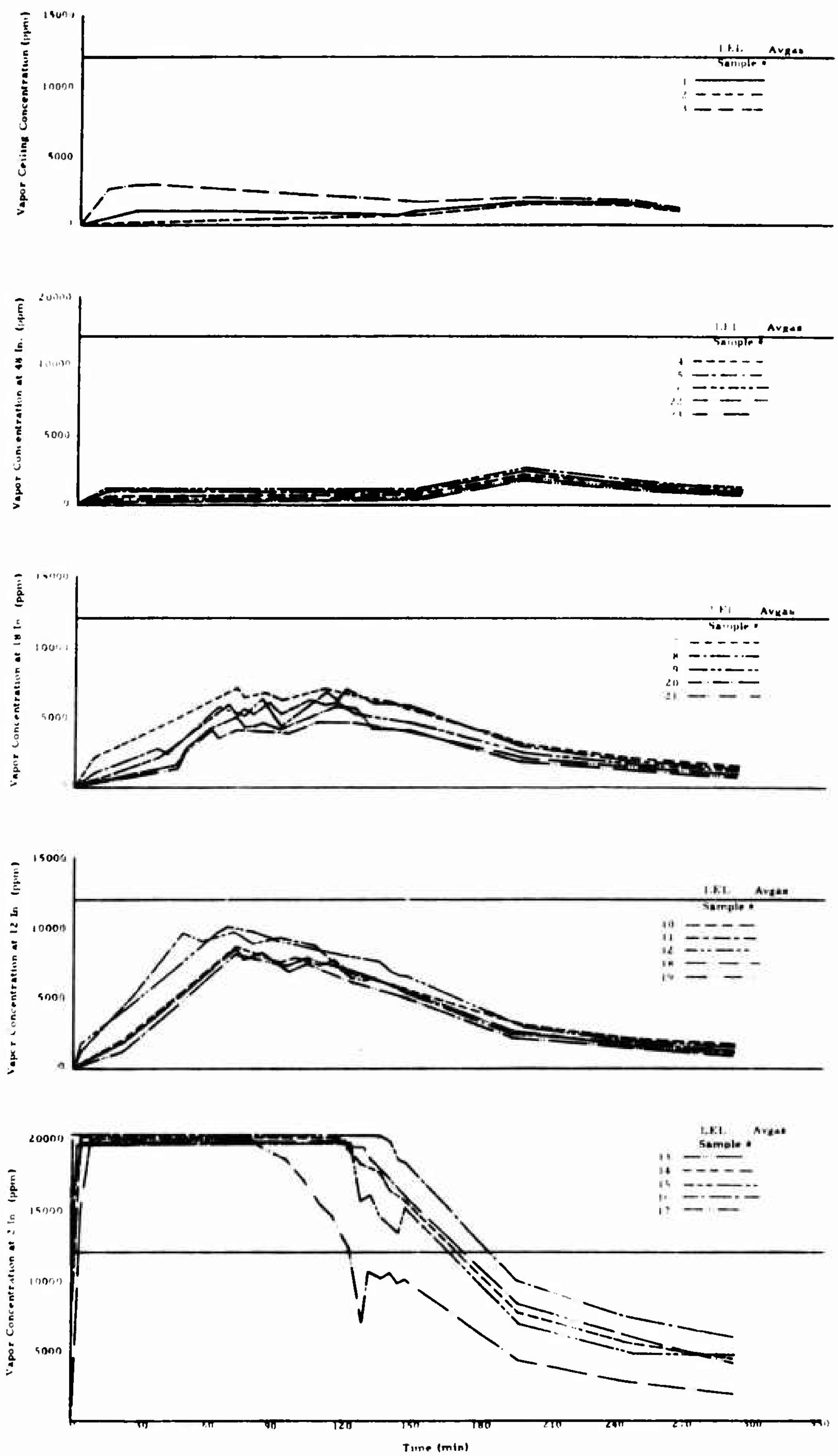


FIGURE III-19. TEST NO. 19–FOUR GALLONS OF AVGAS IN A SPILL TEST

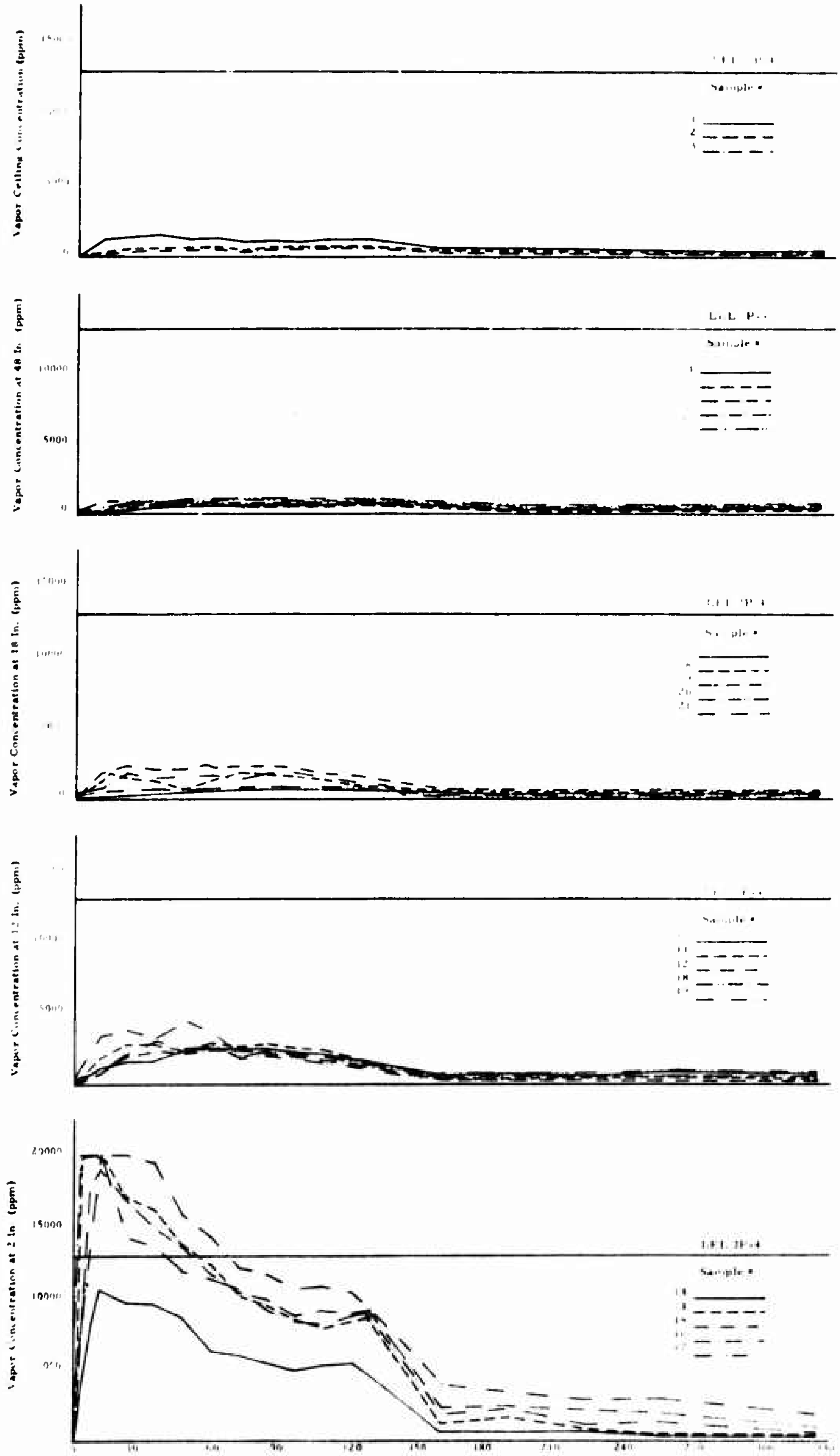


FIGURE III-20. TEST NO. 20 –FOUR GALLONS OF JP-4 IN A SPILL TEST

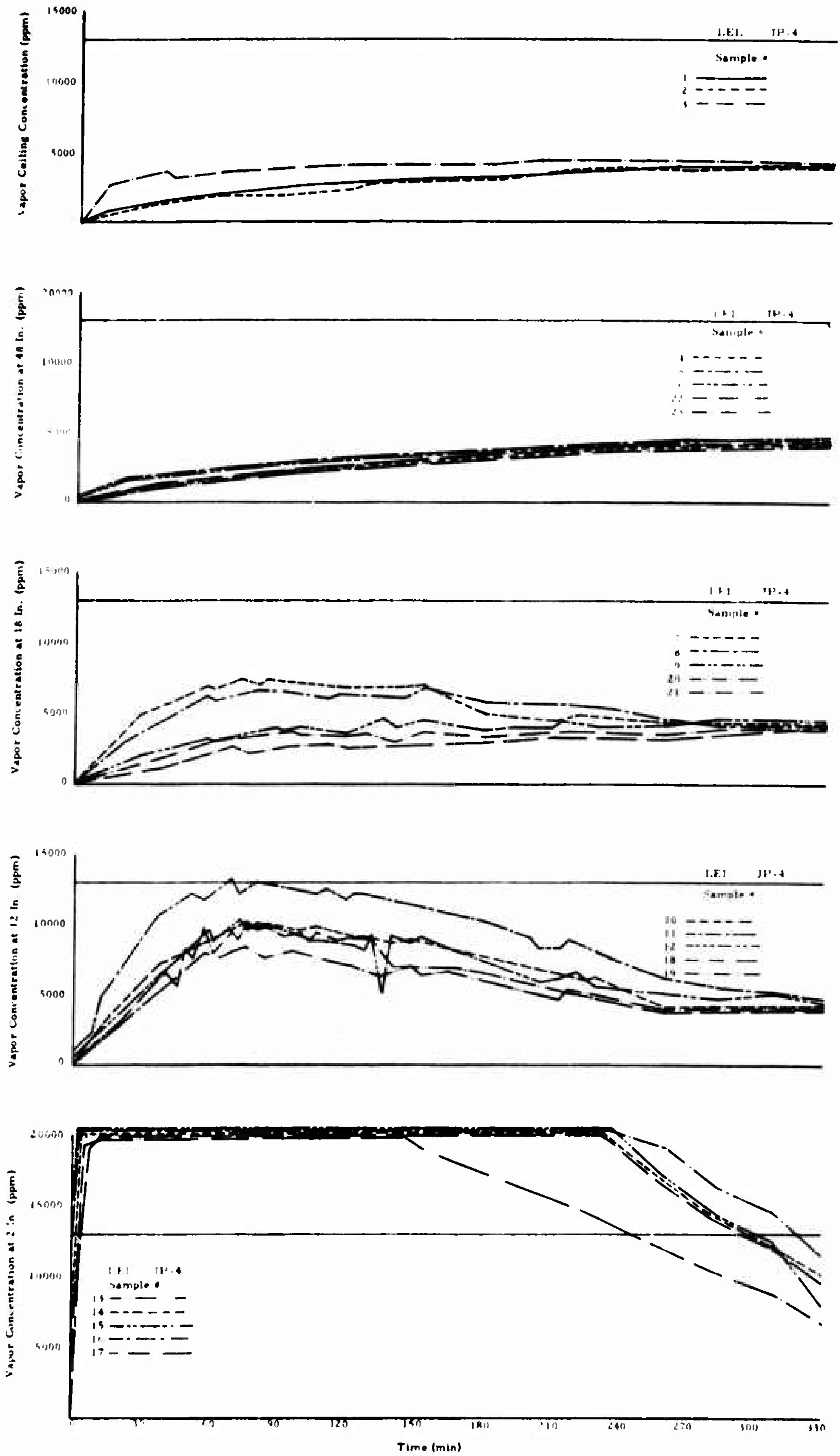


FIGURE III-21. TEST NO. 2; –FOUR GALLONS OF JP-4 IN A SPILL TEST

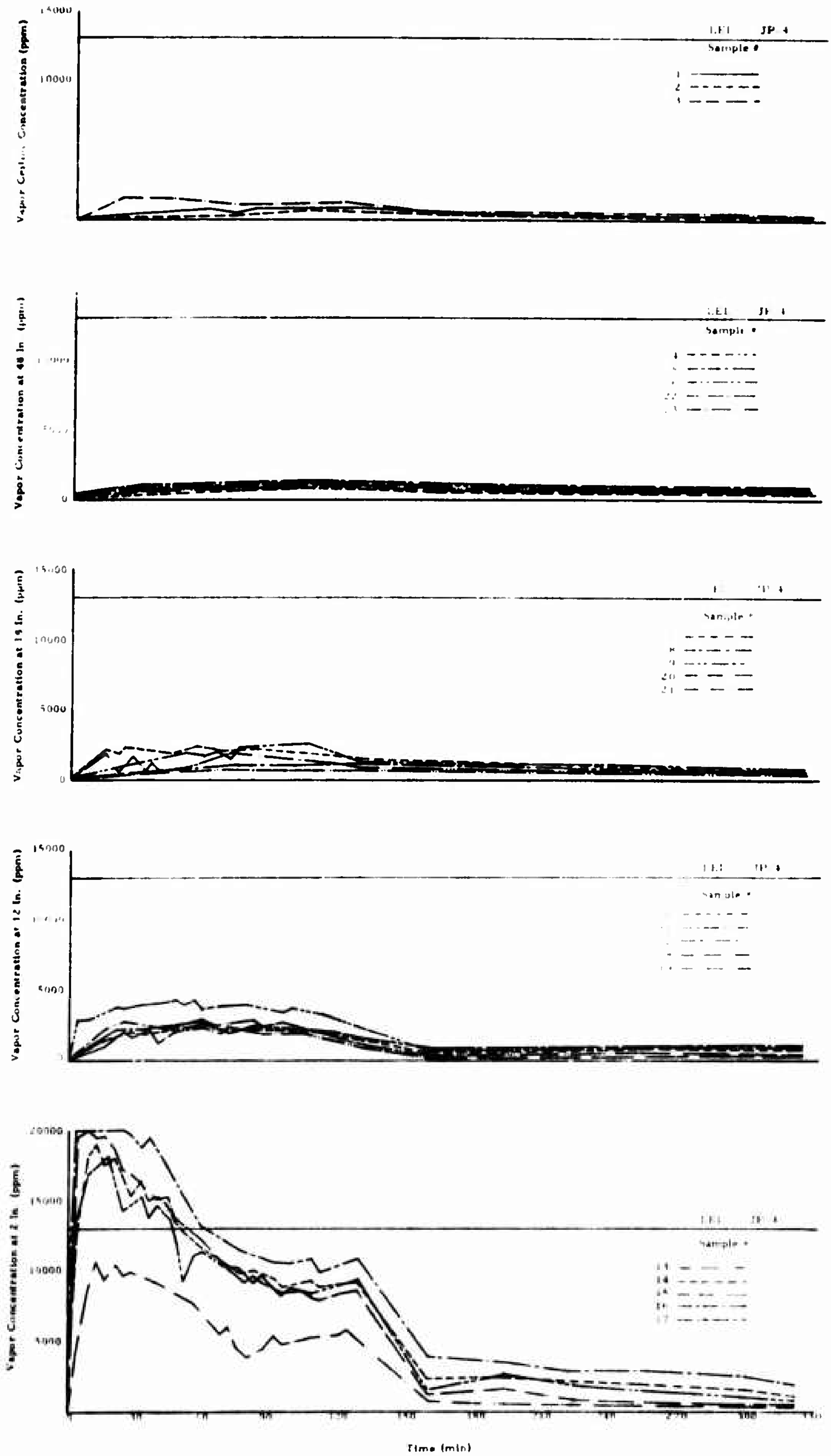


FIGURE III-22. TEST NO. 22 FOUR GALLONS OF JP-4 IN A SPILL TEST

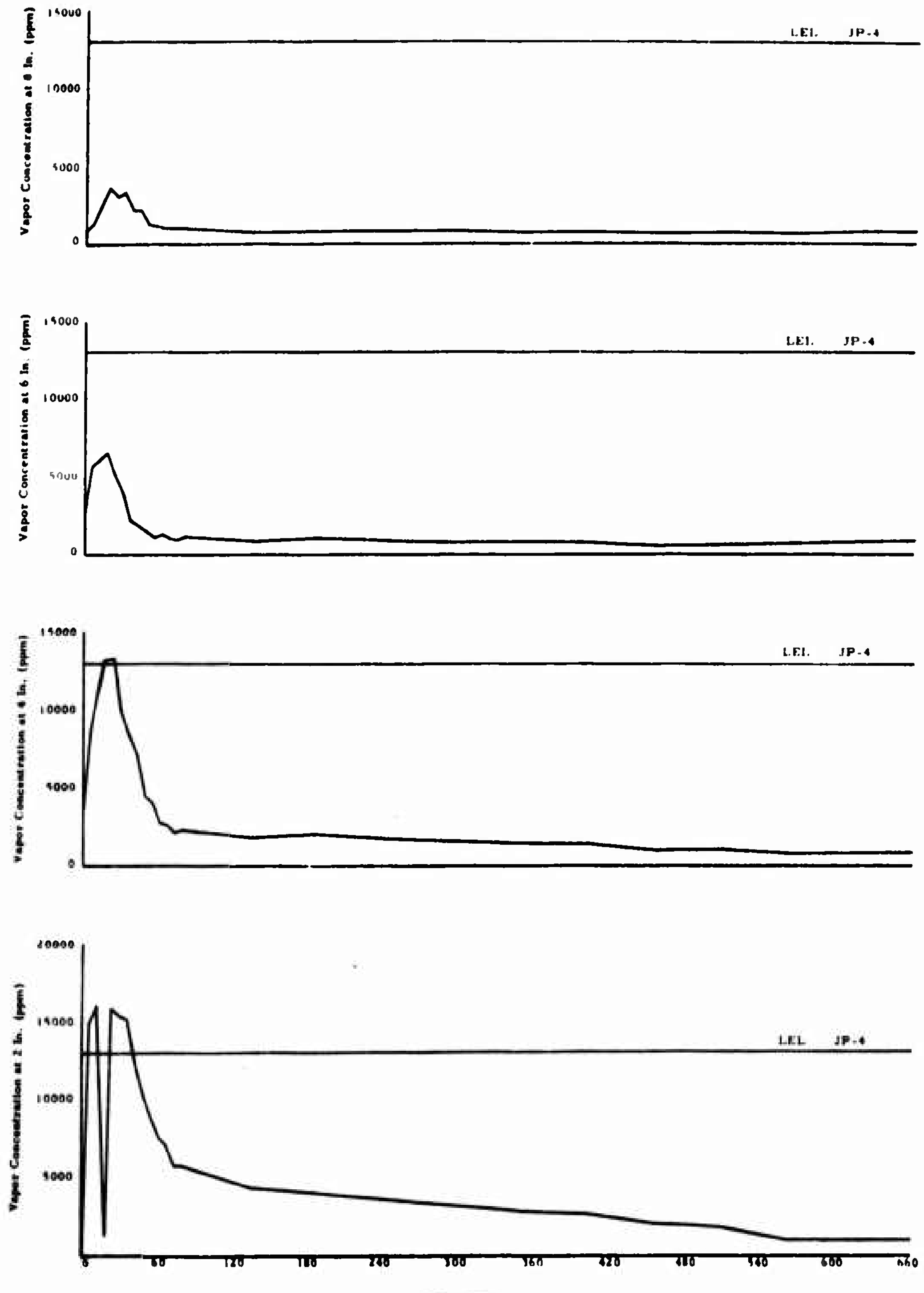


FIGURE III-23. TEST NO. 23–FOUR GALLONS OF JP-4 IN A SPILL TEST

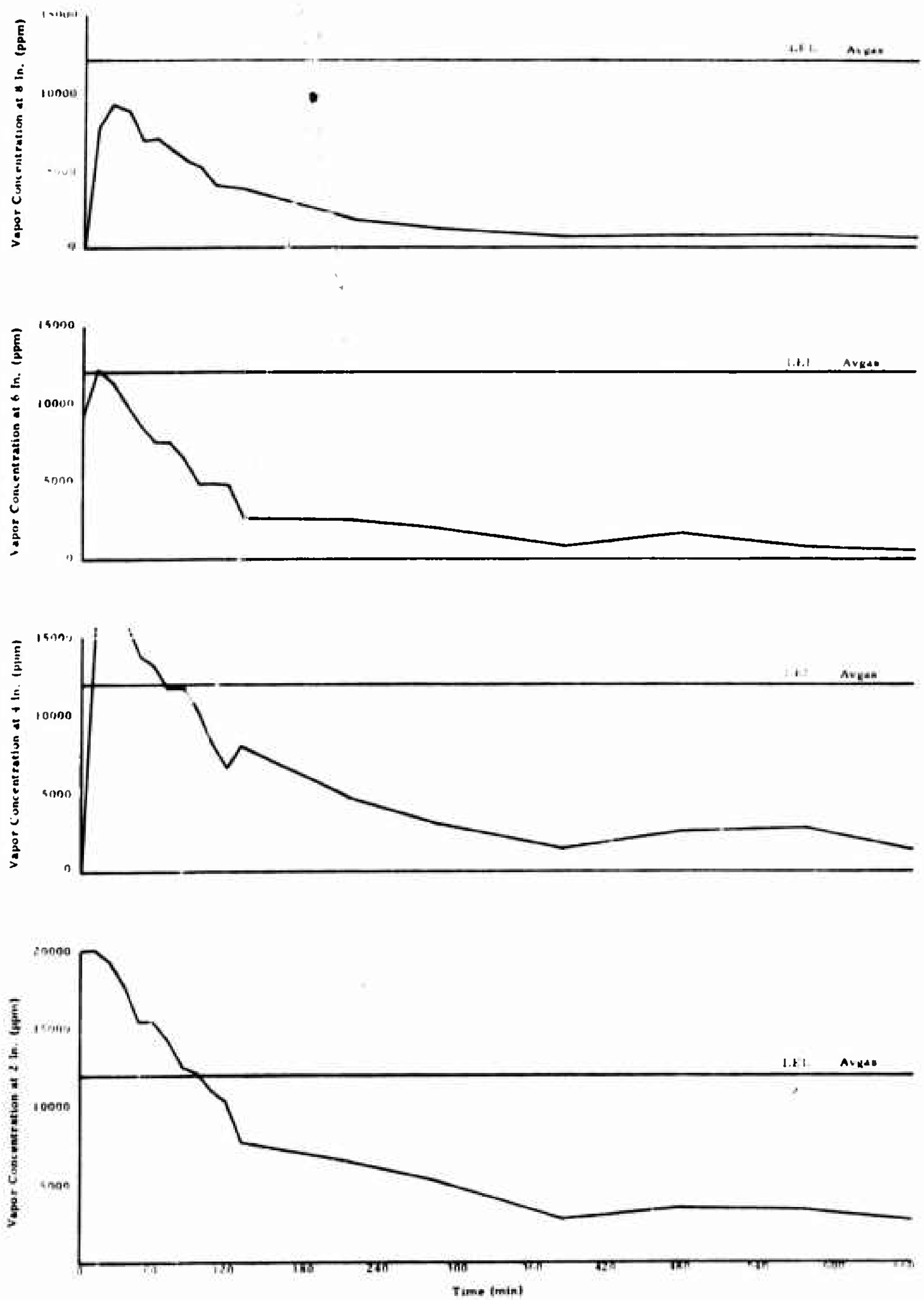


FIGURE III-24. TEST NO. 29–FOUR GALLONS OF AVGAS IN A SPILL TEST

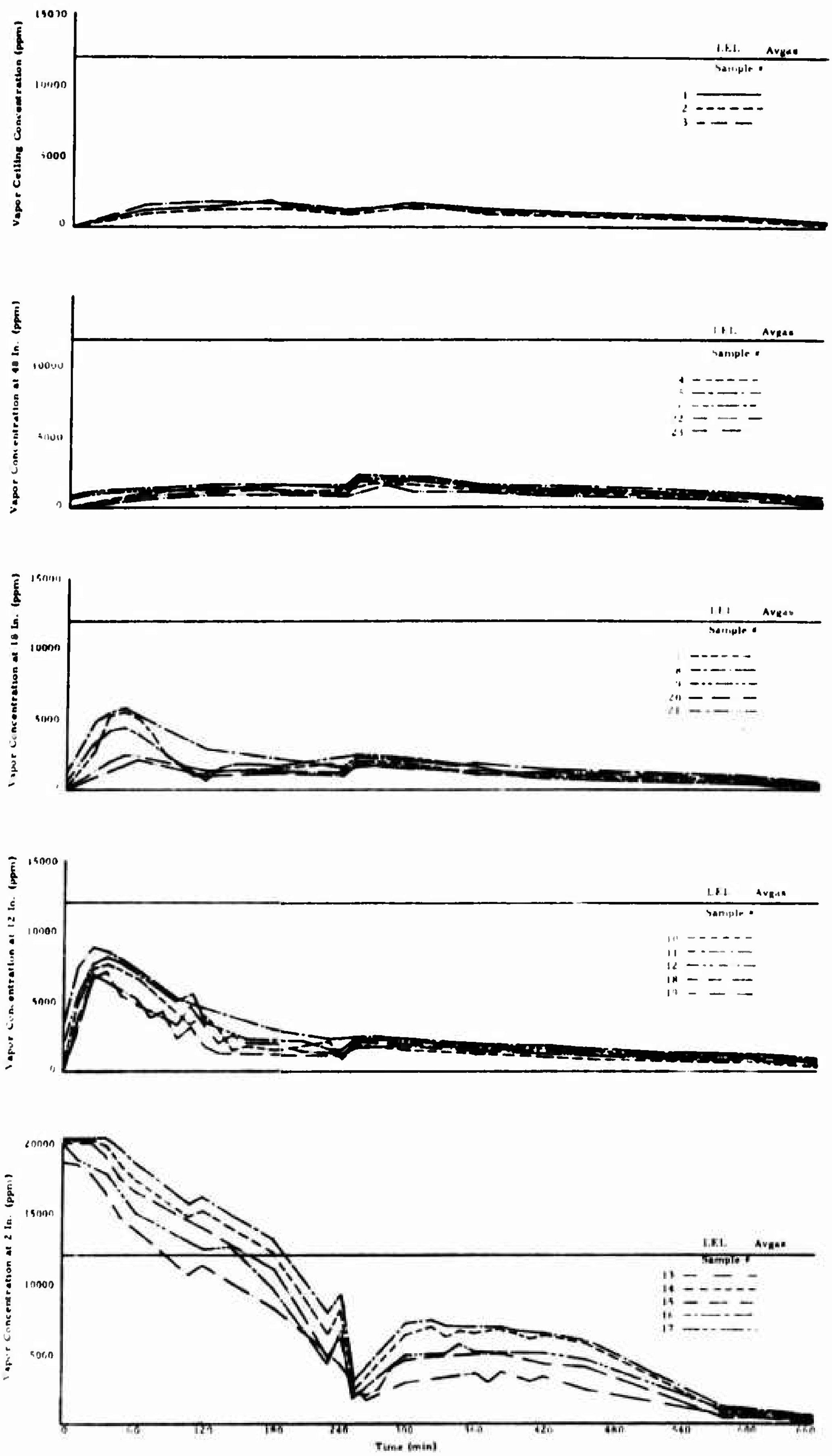


FIGURE III-25. TEST NO. 30–FOUR GALLONS OF AVGAS IN A SPILL TEST

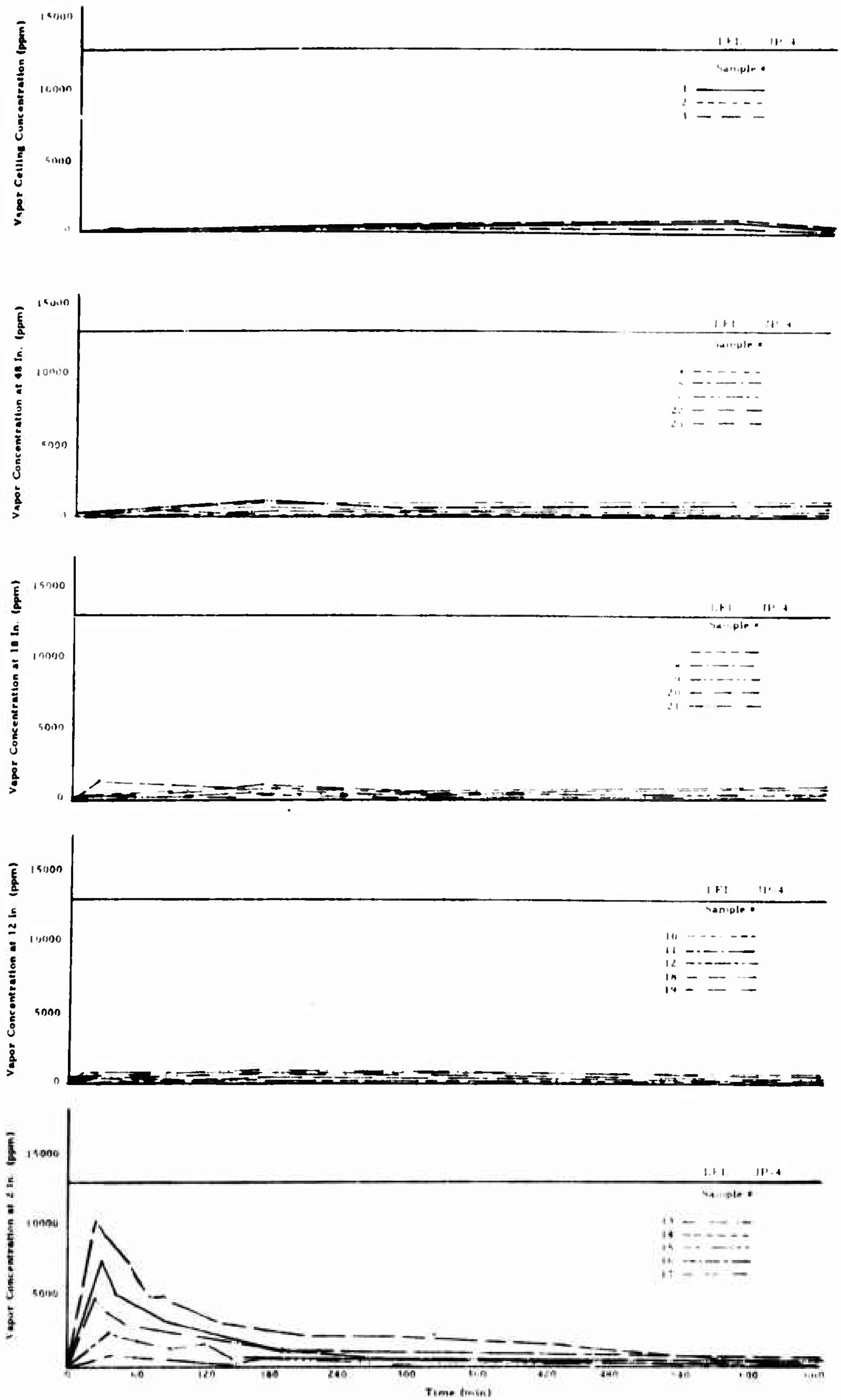


FIGURE III-26. TEST NO. 31 – FOUR GALLONS OF JP-4 IN A SPILL TEST

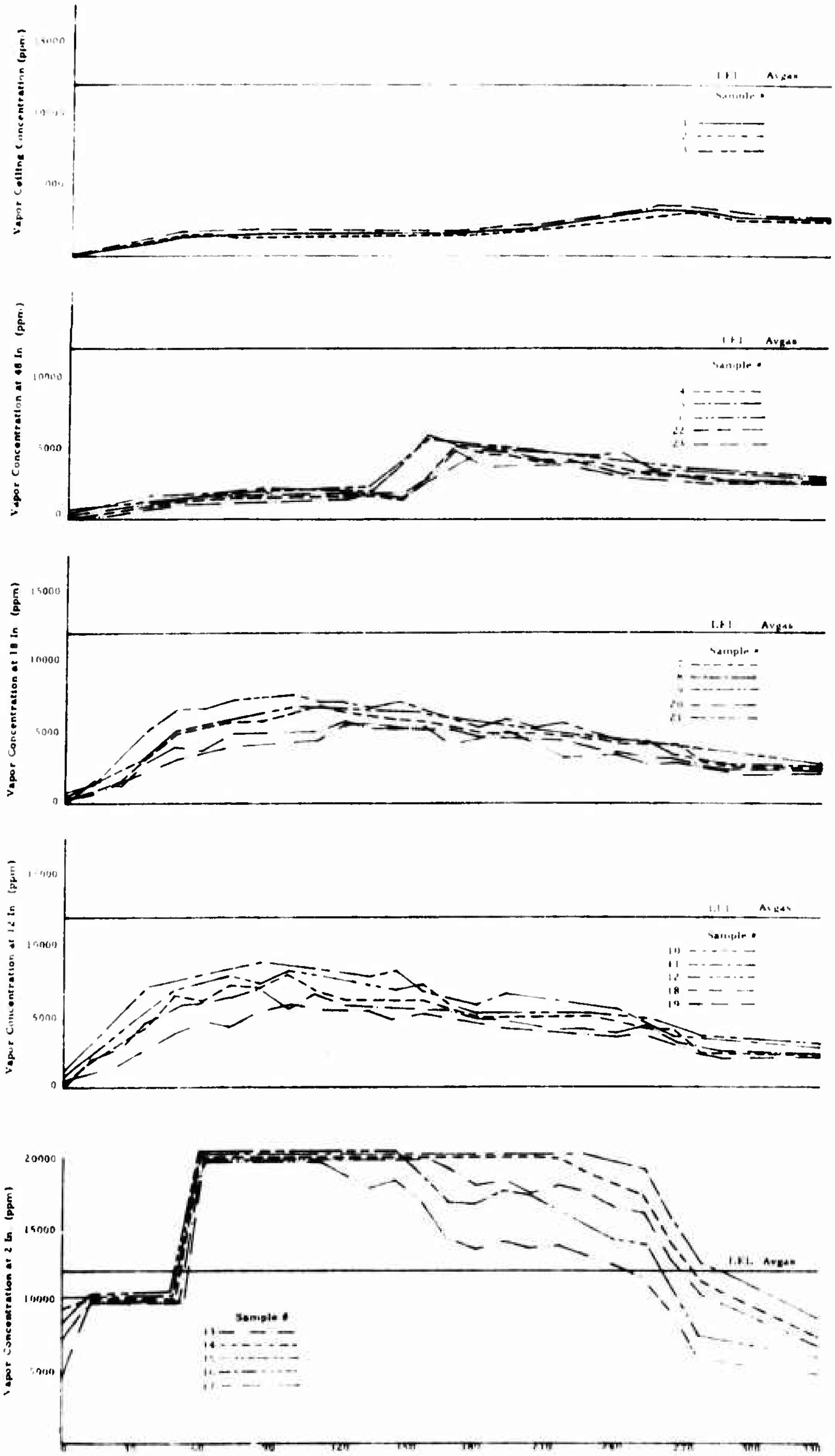


FIGURE III-27. TEST NO. 32 FOUR GALLONS OF AVGAS IN A DRIP TEST

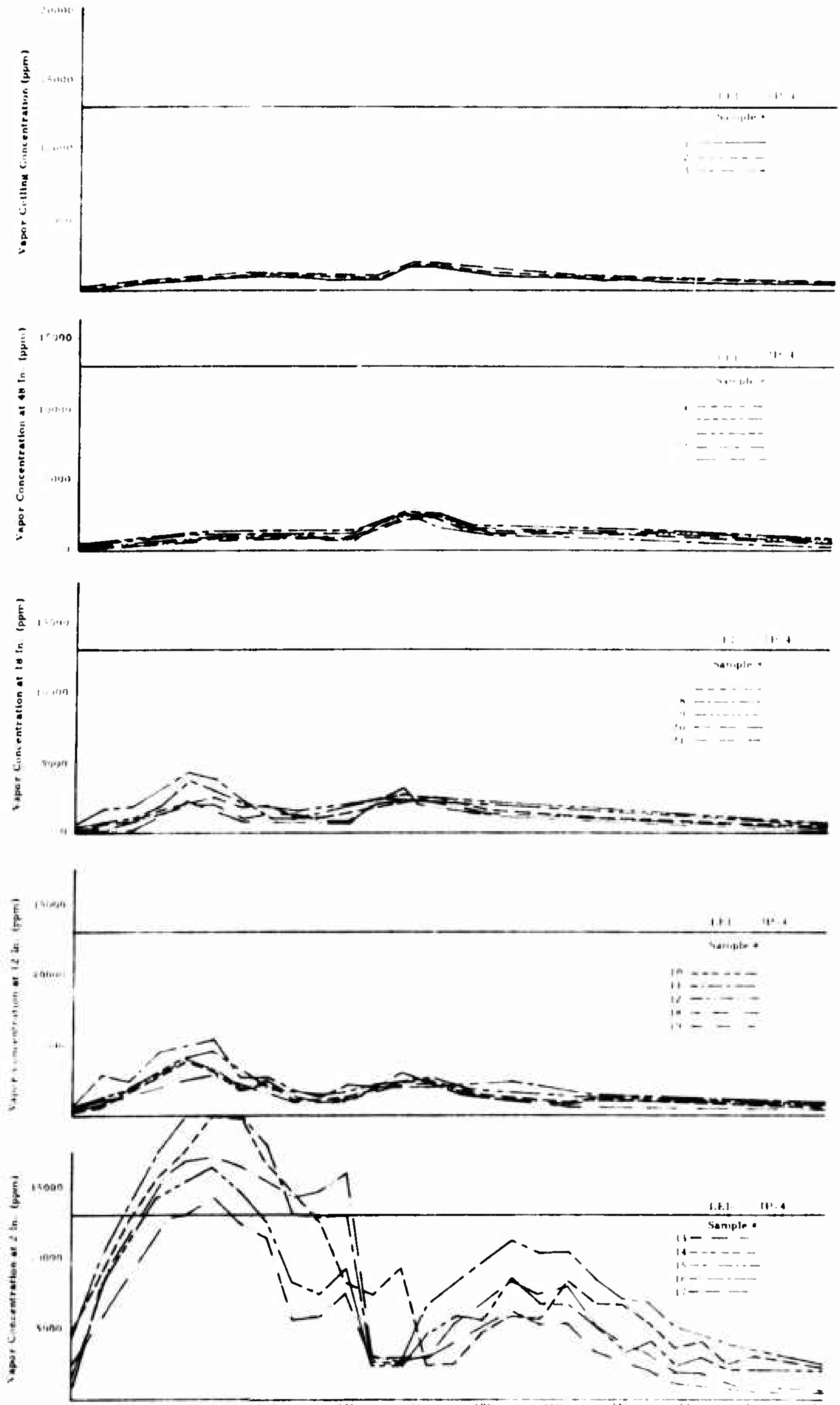


FIGURE III-28. TEST NO. 33 FOUR GALLONS OF JP-4 IN A DRIP TEST

APPENDIX IV

TABLES OF TEST RESULTS

TABLES

Table	Run	Fuel	Temp, °F	Condition
IV-1	1	Avgas	71	1 gal in 6-sq ft pan
IV-2	2	JP-4	73	1 gal in 6-sq ft pan
IV-3	3	Avgas	62	2 gal in 5-sq ft pan
IV-4A	4A	Avgas	64	Fuel from Test 3 spilled on floor
IV-4B	4B	Avgas	63	Continue 4A-floor fan started
IV-5	5	JP-4	66	2 gal in 5-sq ft pan w/fan
IV-6	6	Avgas	71	2 gal in 5-sq ft pan
IV-7	7	JP-4	75	2 gal in 5-sq ft pan
IV-8	8	Avgas	72	2 gal dripped from 5 ft
IV-9	9	JP-4	54	2 gal dripped from 5 ft
IV-10	10	JP-4	71	4 gal dripped from 5 ft
IV-11	11	Avgas	79	4 gal dripped from 5 ft
IV-12	12	Avgas	52	4 gal spilled on floor
IV-13	13	Avgas	98	4 gal spilled on floor
IV-14	14	JP-4	97	4 gal spilled on floor
IV-15	15	Avgas	52	4 gal spilled on floor
IV-16	16	Avgas	60	10 gal spilled on floor
IV-17	17	JP-4	50	4 gal spilled on floor
IV-18	18	JP-4	64	10 gal spilled on floor
IV-19	19	Avgas	67	4 gal spilled on floor
IV-20	20	JP-4	67	4 gal spilled on floor
IV-21	21	JP-4	65	4 gal spilled on floor
IV-22	22	JP-4	77	4 gal spilled on floor
IV-23	23	JP-4	62	4 gal spilled on floor (vertical profile run)
IV-24	24	JP-4	45-66	Hangar 935, Kelly AFB
IV-25	25	JP-4	47-78	Hangar 935, Kelly AFB
IV-26	26	JP-4	45-69	Hangar 5, Randolph AFB
IV-27	27	JP-4	57	55-gal spill, Randolph AFB
IV-28	28	JP-4	46-66	Hangar 4337, Bergstrom AFB
IV-29	29	Avgas	69	4 gal spilled on floor (vertical profile)
IV-30	30	Avgas	82	4-gal spill w/fan
IV-31	31	JP-4	89	4-gal spill w/fan
IV-32	32	Avgas	90	4-gal drip w/fan
IV-33	33	JP-4	85	4-gal drip w/fan
IV-34	34	Avgas	75	4-gal spill (vertical profile)
IV-35	35	JP-4	88	4-gal spill (vertical profile)
IV-36	36	Avgas	88	4-gal spill (vertical profile)
IV-37	37	Avgas	76	4-gal drip (vertical profile)

TABLE IV-1. FUEL VAPOR CONCENTRATIONS IN PPM

Test 1 Conditions: Fuel - avgas. Temperature - 71°F. R.H. - 25%. Sample Configuration No. 1. One gallon of avgas poured into a 6-sq ft pan in the center of the room. 11/4/71.

Time (min)*	Sample Point Numbers: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0											0	0	0	0	0	0	0	0	50	50	0	0	0	0
6	700	300	200	200	2250	450	600	500	450	150	150	200	1200	250	200	250	200	250	200	200	250	250	250	250
12	1400	600	550	550	950	550	400	700	750	350	400	400	900	450	600	550	1200	750	550	350	300	250	400	650
18	1550	900	1050	900	950	950	500	900	950	600	650	800	900	800	750	750	1500	1050	550	550	550	600	600	550
24	850	850	900	1100	700	600	700	750	1450	1500	1250	1050	700	750	700	950	3350	1100	750	600	650	600	550	750
30	1000	950	1250	1150	1050	800	1250	1350	1200	850	850	1150	1000	800	900	850	1400	850	1100	1000	700	750	750	850
36	850	850	900	900	1650	1250	1200	1250	1250	800	950	1150	1250	1100	900	1000	1350	850	1050	1050	850	800	850	950
42	1900	1800	1600	1400	1450	1050	1150	1150	1400	850	1100	1150	1250	1150	1050	1050	1250	850	1100	1200	900	850	850	1100
48	900	1050	1250	1200	1050	950	1100	1150	2250	900	1100	1200	1150	1200	1100	1050	850	750	1200	1200	900	1000	1150	1050
54	950	1100	1150	1200	1050	950	1200	1050	1850	1050	1000	1100	1150	950	1200	1000	1050	900	1000	1150	950	950	1000	1100
60	950	1400	1200	1050	1250	1250	850	1150	1350	1400	1250	1300	1550	900	850	1150	850	850	900	800	800	900	650	650
66	850	900	1250	1250	950	1000	1000	1100	900	850	950	950	850	850	950	1000	850	900	950	1100	800	850	1000	1000
72	1050	1150	1100	1150	950	900	1100	1100	800	900	900	950	2300	1400	800	850	800	750	1050	1050	900	950	1100	1100
78	950	1050	1000	1100	1050	950	1200	950	1300	900	900	950	850	850	950	950	850	850	1100	1150	900	900	1000	950
84	1000	1100	1200	1150	1050	950	950	950	950	850	900	950	900	900	900	1000	900	900	1150	1100	900	950	950	1050
90	1100	1000	1150	1200	1000	950	950	950	1200	900	950	950	900	850	850	1000	900	850	900	1100	900	900	900	1050
96	1250	1000	1100	1130	1000	950	950	1150	1050	950	950	1000	900	900	1000	1000	950	950	1100	1100	900			

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min).

TABLE IV-2 FUEL VAPOR CONCENTRATIONS IN PPM

Test 2 Conditions Fuel JP 4 Temperature 73°F R H 25% Sample Configuration No 1 One gallon JP-4 poured into a 6-sq ft pan in the center of the room. 11/4/71

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0													50	50	50	50	50	50	50	50	50	50	50	50
6	150	190	200	100	150	150	250	200	150	100	200	150	100	150	250	200	150	200	310	430	260	260	310	380
12	320	330	420	430	860	420	360	370	630	370	400	355	610	370	350	360	330	350	430	410	350	370	520	495
18	730	430	470	470	680	530	450	470	1000	550	450	400	650	400	400	450	350	350	370	450	300	350	350	400
24	650	400	400	400	1050	550	450	500	700	550	550	500	650	550	450	450	650	450	500	450	450	450	550	400
30	570	570	600	600	1400	760	650	600	1400	550	600	600	950	500	500	550	950	450	550	650	450	500	650	700
36	850	600	650	600	1350	650	650	700	1250	700	600	650	1600	700	650	650	950	650	700	650	500	650	750	650
42	1150	750	700	750	1550	450	600	750	2000	750	760	800	1160	800	640	800	1060	620	840	800	550	650	700	560
48	1300	850	750	750	1250	750	750	650	1950	850	700	700	850	800	650	650	1090	560	700	700	530	590	600	600
54	1350	1050	820	760	1250	900	850	850	1600	810	850		1100	760	770	770	1740	800	660	850	560	620	580	800
60	890	790	790	740	1360	760	700	740	1710	800	720	750	900	700	650	650	1400	580	650	780	560	550	630	630
66	1350	750	690	750	1400	800	900	900	1820	820	700	700	1300	720	720	690	1050	640	660	710	550	570	640	650
72	1150	840	820	740	1430	860	750	700	2300	860	750	750	1100	870	800	650	1250	700	700	700	600	600	610	600
78	1700	1100	900	830	1350	910	850	860	1730	940	850	800	850	840	750	800	1300	700	700	760	700	800	840	700
84	1200	950	850	850	1750	1130	940	700	2060	990	770	760	920	850	630	760	1280	700	780	800	650	660	750	700
90	1030	880	960	900	2070	1100	810	800	1850	900	800	830	1550	950	760	810	1070	660	650	750	640	650	650	650
96	1100	800	900	800	1950	1090	900	860	1960	990	770	800	1000	800	760	800	1020	700	750	600	720	700	700	780
102	960	840	820	800	1560	1120	980	850	1280	880	780	800	1260	770	760	750	1450	850	600	700	680	680	700	680
108	1300	900	850	860	1650	900	860	860	1610	920	800	750	1120	680	850	820	1050	800	800	900	760	750	760	850
114	1150	960	900	860	1400	900	900	810	1460	1000	850	840	1400	960	800	800	1020	760	770	810	750	750	750	750
120	1510	1150	900	800	1360	930	840	850	1360	1120	1030	840	1120	1020	900	800	910	760	740	800	740	750	750	760
126	1370	920	860	860	1460	950	870	830	1400	850	860	850	1220	660	850	820	820	610	850	850	800	810	850	750
132	1170	900	900	900	1320	1100	1250	1100	1400	950	950	950	810	800	900	950	780	840	870	900	800	840	840	850
138	1050	1040	960	900	1480	960	920	900	1220	900	850	850	1450	900	850	840	840	840	840	840	840	840	840	850
144	900	900	900	900	1220	950	900	900	1680	1240	900	900	1000	900	880	600	850	850	850	830	800	800	600	600
150	800	740	730	800	800	730	730	800	850	810	750	750	800	800	840	780	800	800	780	780	780	780	780	800
192	900	800	800	780	1150	850	780	780	950	950	780	780	750	780	780	780	780	780	750	750	750	750	750	750
210	650	650	650	650	650	650	650	550	650	550	650	680	750	750	700	700	700	700	700	700	700	700	700	700

*The time shown corresponds to Sample Point No 1. Each sample point beyond No 1 is spaced 15 sec (e g , Sample Point No 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min)

TABLE IV-3 FUEL VAPOR CONCENTRATIONS IN PPM

Test 3 Conditions: Fuel - avgas. Temperature - 62°F. R.H. - 60%. Sample Configuration No. 1. Two gallons of avgas poured into a 5-sq ft pan in the center of the room. 11/8/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	450	0	650	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100
6	450	50	0	0	0	0	50	0	50	0	0	0	50	50	50	50	50	50	50	50	50	50	50	100
12	250	100	50	50	200	50	50	50	50	50	100	50	100	100	100	100	100	100	100	100	175	185	175	180
18	685	170	170	200	180	170	170	180	165	190	205	190	215	185	170	175	215	210	210	205	230	220	220	225
24	300	320	255	265	260	255	260	220	235	250	210	230	230	265	265	265	305	280	270	255	300	245	285	285
30	545	275	550	300	315	305	305	300	310	325	310	320	320	340	345	245	275	270	270	270	300	[illegible]	300	300
36	625	320	310	320	305	290	275	290	320	325	285	270	310	305	285	300	325	310	305	310	335	325	320	330
42	740	315	320	335	330	345	335	300	325	290	290	340	340	350	335	315	350	330	315	295	355	345	350	345
48	580	355	425	370	375	365	350	370	350	370	375	375	[illegible]	370	330	350	385	355	325	375	355	[illegible]	350	360
54	725	335	320	365	335	325	345	330	340	350	350	365	380	395	375	380	415	370	320	380	395	[illegible]	390	400
60	570	375	380	425	505	395	390	415	430	425	420	355	400	380	410	460	420	410	355	415	425	[illegible]	410	475
66	540	400	405	420	510	440	430	435	435	440	440	480	425	435	420	480	470	435	465	510	490	[illegible]	495	535
72	820	525	470	545	475	465	450	460	475	450	445	445	470	480	[illegible]	495	495	470	540	625	530	[illegible]	570	540
78	605	565	420	515	500	460	440	440	460	465	475	520	470	485	495	660	530	470	515	520	455	[illegible]	600	600
84	720	450	480	495	530	500	515	490	470	470	485	505	465	460	510	555	475	470	435	545	485	[illegible]	545	580
90	1000+	665	475	530	565	510	515	685	510	515	565	600	515	510	495	630	515	500	555	600	535	[illegible]	610	650
96	355	550	510	480	455	460	515	480	490	515	470	445	465	465	420	480	520	485	440	505	585	[illegible]	460	435
102	1000+	500	435	575	475	495	500	510	505	490	540	580	555	555	565	655	560	570	555	580	555	[illegible]	715	730
108	925	580	605	585	670	540	555	570	540	505	530	670	555	565	535	660	530	560	545	535	555	[illegible]	595	675
114	100+	550	555	580	1000+	615	615	560	560	525	560	625	515	525	630	660	550	500	600	700	550	[illegible]	650	650

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec. Sample Point No. 20 is 300 sec or 5 min)

TABLE IV-43. FUEL VAPOR CONCENTRATIONS IN PPM

Test 4A Conditions: Fuel: avgas Temperature: 64°F R.H.: 63% Sample Configuration No. 1 Two gallons of avgas weathered in Test 3 were dumped onto the floor near the center of the east wall (11/8/7[illegible])

Time (mins)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0				750	600	600	600	650	630	650	650	650	650	650	650	700	650	650	650	650	650	550	700	750
6	700	650	600	650	650	600	650	650	600	650	650	700	1900	1800	1050	800	2150	1150	800	800	3300	850	750	750
12	4900	3650	1200	1400	5450	2850	1450	1700	6750	1800	1500	1200	6300	2600	2050	1450	8100	2100	1600	1050	6300	2300	1350	1050
18	8000	3450	2500	1550	7300	3200	2550	1600	4900	3650	2400	1450	8450	3250	2200	1500	4000	3150	1800	1150	7300	2800	1800	1150
24	9150	4100	3350	2600	4700	3450	3200	2650	4750	4300	3300	2650	9150	4050	2300	1750	9300	3950	2650	1800	6950	3550	1850	1450
30	7850	4450	3800	3350	7900	4450	3650	[illegible]	8550	4650	3650	3100	8200	4200	3600	2300	3450	4150	3150	2400	7100	3800	3400	1750
36	7750	4500	4100	3750	7050	4450	3450	3500	8400	4550	3300	3000	8050	4200	3750	3400	7000	3000	3450	3300	6600	3450	3500	3600
42	7000	4150	4050	3950	7050	4100	3300	3800	7400	4250	3950	3600	6650	4100	3550	2900	6600	3450	2750	2300	6200	2200	1600	1400
48	7350	3850	3600	3600	7000	3450	3650	3500	[illegible]	4000	3300	2650	6450	3550	2550	2350	7050	4050	1800	1850	5400	2000	1700	1400
54	7350	3750	3650	3600	7500	3950	3500	2850	7950	4000	3200	2800	7600	3850	2800	1750	6950	2450	1700	1550	6100	2150	1800	1550
60	7800	3650	3150	3200	7300	3450	3200	2750	7850	4200	2250	1800	6900	3700	2650	1850	6650	3350	2100	1750	5350	1950	1750	1600
66	7150	3900	3400	3250	7150	3850	3150	2200	7700	4400	2450	2200	7600	3430	2450	1800	8550	3050	1850	1800	6600	2100	1750	1600
72	8050	3750	2450	1750	7700	3600	2050	2000	8600	4700	2400	1350	8400	3300	2350	1800	8700	2450	1850	1450	7150	1950	1400	1700
78	8400	3800	2450	1950	7400	3900	2300	2400	7700	4000	2250	2050	7450	3350	2500	2000	7900	4200	2000	1450	6200	2300	1900	1850
84	7500	3250	2200	2050	7550	3700	2600	2400	8300	4050	2500	2300	5700	3750	2550	2000	7100	3000	2150	1450	5050	2050	2100	1900
90	6200	3400	2700	2250	6200	3100	2350	2500	6100	3150	2200	2000	5800	2700	2250	2150	6050	2650	2200	2050	4900	2000	1450	1900
96	5750	2550	2300	2100	5650	2750	2350	2200	6550	2350	2450	2250	6050	2700	2250	2100	6250	2550	2100	2000	4700	2150	1950	1950
102	6400	2700	2350	1950	6250	3200	2350	2300	6050	3200	2250	2150	6200	2350	2250	2100	5950	2400	2100	2000	5100	2250	2050	1950
108	5600	2900	2250	2100	5500	3000	2300	2200	6350	3250	2350	2100	6500	2750	2250	2100	6800	2800	2150	1950	5250	2200	2100	1900
114	6550	2950	2200	2000	6300	3200	2600	2300	7300	2800	2450	2200	6350	2950	2500	2150	6350	3200	2200	2150	5500	2550	2500	2100
120	7100	3800	2450	2200	7200	4000	2300	2100	7450	4450	2400	2150	7150	3400	2400	2200	6700	2750	2200	2000	6100	2400	2150	2000
126	7550	4350	2650	2100	7450	4150	2450	2200	7300	3550	2450	2300	7200	3350	2450	2200	7350	3150	2300	2050	6500	2500	2400	2100
132	7700	4100	2500	2150	7600	4100	2350	2150	7600	4300	2500	2350	7700	3750	2550	2300	7150	2800	2300	2150	6300	3000	2500	2100
138	7500	4500	3100	2250	7450	4450	2650	2200	7300	4750	2450	2250	6950	3200	2450	2300	7000	2800	2450	2200	5450	3000	2400	2150
144	7250	4750	3500	2400	7250	4550	2800	2250	7450	4700	2550	2200	7250	3800	2650	2300	7200	3150	2300	2150	6100	2500	2500	2000
150	7300	4550	3250	2100	7100	4650	2700	2200	7150	4600	2550	2200	7000	3400	2500	2300	6750	3200	2300	2100	6200	2450	2400	2100
156	7250	4850	3350	2200	7100	4550	2450	2200	7300	4300	2500	2300	7300	3850	2500	2300	7600	3200	2300	2100	6150	2500	2350	2150
162	7350	4500	2550	2350	7300	4400	2550	2400	7600	3750	2550	2350	6800	3250	2500	2300	6800	3450	2350	2100	5900	2500	2450	2150
198	7350	3900	2550	2300	5850	2950	2400	2300	6150	2250	2050	2350	5250	2500	2350	2250	5500	2500	2350	2250	4200	2700	2350	2250
234	5200	2650	2400	2250	3500	2500	2200	2200	3800	2350	2050	2150	3750	2300	2200	2200	3300	2150	2000	1800	2500	2050	2000	1950
270	3050	2250	1950	2300	2450	1800	2000	1750	2050	1750	1550	1650	1950	1750	1500	1500	2300	1800	1700	1650	1650	1650	1650	1600
306	1950	1700	1750	1350	1600	1350	1400	1300	1550	1450	1300	1250	1400	1250	1300	1300	1450	1250	1250	1400	1400	1350	1450	1500

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min)

TABLE IV-4b FUEL VAPOR CONCENTRATIONS IN PPM

Test 4B Conditions: Fuel - avgas. Temperature - 63°F. R.H. - 73%. Sample Configuration No. 1. Fans were turned on at the end of Test 4A in which two gallons of avgas that had weathered in Test 3 were dumped onto the floor. 11/8/71.

Time (min)*	Sample Point Numbers																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0				920	900	950	950	900	850	850	800	800	750	700	700	700	660	690	680	635	555	560	565	535
6	535	545	550	550	510	500	490	475	485	445	465	435	425	415	415	410	380	370	360	355	295	320	315	300
12	310	310	305	305	320	295	305	300	295	275	275	265	265	255	240	230	230	220	210	215	180	180	185	180
18	200	185	180	185	200	185	185	170	195	175	170	165	175	160	150	145	145	140	135	130	115	105	115	105
24	130	120	120	120	135	120	110	110	130	130	110	110	110	105	95	95	100	95	90	95	85	75	80	80
30	100	90	90	95	95	90	90	90	105	90	105	95	95	80	90	90	80	70	70	80	75	70	75	70
36	90	80	80	80	90	85	85	80	90	95	85	75	90	85	85	80	80	75	70	70	70	70	70	70
42	85	75	80	80	100	80	80	85	85	80	80	80	85	70	70	70	75	80	70	70	70	70	65	65
48	80	75	75	70	80	70	70	70	80	70	75	65	80	70	70	70	65	60	60	60	55	50	60	55
[illegible]	75	65	70	65	70	60	60	60	70	60	70	60	65	70	70	65	65	65	65	65	65	50	55	50
144	60	55	55	55	60	50	50	50	60	50	50	50	55	50	45	40	45	45	40	40	40	40	40	40
150	50	50	45																					

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min)

TABLE IV-5 FUEL VAPOR CONCENTRATIONS IN PPM

Test 5 Conditions: Fuel - JP-4. Temperature - 66°F R H - 76% Sample Configuration No. 1. Two gallons of JP-4 in 5-sq ft pan in the center of the room, the fuel was not dumped onto the floor, but the blowers were turned on.

Time (min)*	Sample Point Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	5	5	10	10	5	5	5	10	10	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0
12	110	200	50	355	30	30	35	65	40	35	30	40	45	50	60	50	70	45	30	30	50	50	50	50
18	105	40	45	55	50	35	45	40	25	40	40	40	55	50	35	35	65	45	35	55	70	60	70	70
24	130	100	60	60	70	60	45	70	50	45	65	55	70	60	45	60	85	60	45	45	95	80	75	85
30	260	120	95	70	55	75	65	75	90	95	60	100	95	70	65	55	90	70	90	70	90	100	95	100
36	265	70	75	75	95	95	75	80	70	80	90	100	110	105	105	70	110	105	70	60	110	100	85	105
42	410	135	90	95	80	70	90	90	120	95	95	95	110	115	90	90	120	90	105	70	120	115	105	120
48	335	65	75	60	70	85	90	95	95	100	80	75	100	85	65	55	115	95	70	80	120	110	90	80
54	125	90	80	95	135	115	100	75	110	115	75	85	120	100	100	95	140	125	105	100	140	125	105	110
60	405	85	80	80	115	125	95	85	120	100	85	95	130	105	95	75	130	90	95	70	120	115	75	125
66	180	110	80	85	140	125	100	95	140	145	60	70	120	100	90	100	125	110	105	105	135	85	120	165
72	355	185	95	85	135	135	130	90	155	120	75	65	135	120	85	90	125	115	70	95	105	105	105	100
78	250	110	80	95	120	105	75	70	85	90	90	95	110	80	70	105	115	105	110	75	120	115	95	115
84	410	145	85	65	95	100	85	85	105	115	125	90	120	80	40	60	135	110	70	90	125	115	105	100
90	365	115	105	135	225	125	100	85	90	80	90	110	100	100	90	50	85	40	40	45	100	100	95	100
96	475	155	80	55	155	120	60	60	200	70	65	65	125	115	100	95	100	100	70	75	105	90	65	95
102	150	60	55	55	110	115	185	60	110	100	85	65	130	105	80	90	130	115	100	105	150	150	75	85
108	370	220	150	105	190	80	75	90	115	105	105	75	135	95	70	55	110	60	60	55	110	100	100	105
114	195	100	75	80	150	110	110	105	105	75	40	60	100	55	75	80	75	85						

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min)

TABLE IV 6 FUEL VAPOR CONCENTRATIONS IN PPM

Test 6 Conditions Fuel - avgas Temperature - 71°F R H - 87%. Sample Configuration No. 2. Two gallons of avgas in a 5-sq ft pan in the center of the room, the run was made to coordinate the sample configuration with that used in Tests 1-5. 11/10/71.

Time (min)*	Sample Point Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	1000+	825	420	110	70	80	35	80	155	0
6	160	250	50	0	50	0	0	0	0	0	0	0	0	0	1000+	1000	450	50	100	50	50	50	50	0
12	100	150	100	50	100	100	50	50	50	50	50	50	50	0	1000+	350	1100	150	100	50	100	100	100	0
18	150	150	150	100	100	100	50	50	100	50	100	50	100	50	1000+	600	1800	150	100	100	100	150	200	0
24	150	200	150	100	150	150	100	150	100	50	100	100	100	50	1000+	1200	950	150	150	100	150	150	150	0
30	200	250	200	150	200	200	150	150	150	100	150	150	150	100	1000+	1200	350	150	150	450	150	150	150	0
36	200	250	250	150	200	200	150	150	150	150	200	150	200	150	1000+	500	1000	200	250	200	200	200	250	0
42	250	300	250	250	250	250	200	200	200	150	200	150	200	100	1000+	1250	550	250	250	200	250	250	250	0
48	250	250	250	250	250	250	250	250	250	200	250	200	250	200	1000+	1050	750	250	300	300	250	300	300	0
54	250	300	300	310	365	350	345	330	320	295	310	300	320	270	1000+	1000+	650	330	370	335	320	310	335	0
60	300	420	320	365	360	365	320	325	325	310	320	315	345	280	1000+	1000+	1000+	350	335	355	330	325	320	0
66	300	335	300	360	395	355	355	365	350	345	335	345	250	325	1000+	1000+	740	355	405	445	315	385	495	0
72	370	410	310	405	375	365	330	360	320	320	345	305	340	260	1000+	1000+	855	350	455	340	330	360	390	0
78	325	350	325	365	400	410	375	360	320	310	350	330	365	310	1000+	1000+	610	375	435	435	345	375	505	0
84	325	430	330	425	425	390	365	365	360	340	330	355	290	350	1000+	820	590	430	470	405	340	380	515	0
90	315	365	310	425	405	385	325	350	335	330	330	315	365	275	1000+	695	1000+	355	825	440	355	380	480	0
96	335	370	355	370	415	415	400	375	355	335	355	350	380	355	1000+	1000+	880	520	395	395	385	395	400	0
102	345	350	335	375	430	380	410	370	410	405	340	375	350	335	1000+	840	1000+	405	410	480	405	450	575	0
108	375	395	340	455	475	440	360	380	355	320	360	315	395	335	1000+	1000+	1000+	380	405	365	365	400	495	0
114	350	375	360	400	455	440	405	390	330	310	365	315	390	270	1000+	1000+	1000+	375	335	410	350	400	510	15
120	365	375	365	400	425	440	470	340	365	360	375	350	385	355	1000+	700	565	395	490	415	405	425	525	25
126	380	375	385	480	465	480	425	405	370	350	425	365	410	330	1000+	1000+	1000+	390	370	410	390	425	515	35
132	375	385	375	480	465	450	415	435	395	385	405	405	425	360	1000+	880	830	570	430	420	420	445	485	35
138	390	405	400	445	480	475	435	455	425	385	445	400	450	455	1000+	1000+	665	500	[illegible]	405	420	450	555	35
144	395	415	405	485	550	475	395	455	425	420	445	385	435	380	1000+	850	775	450	515	620	450	465	600	35
150	400	400	405	545	530	500	460	450	430	455	430	440	395	1000+	1000+	1000+	460	525	565	565	440	500	605	35
156	435	430	440	570	535	515	450	500	455	460	475	400	475	450	1000+	1000+	750	500	455	450	465	475	555	35
162	450	470	400	530	540	530	500	490	485	470	500	[illegible]	495	455	1000+	900	635	695	550	505	505	530	630	35
168	435	460	425	525	575	575	435	435	450	415	495	435	510	470	1000+	1000+	670	530	510	505	665	495	620	35
174	460	455	405	565	520	565	545	535	500	430	485	435	505	455	1000+	830	1000+	510	510	475	485	565	605	35
180	485	505	510	585	550	535	415	520	500	455	495	465	500	470	1000+	1000+	940	440	530	565	495	525	625	35
186	520	500	470	58	545	565	540	530	520	500	545	505	520	500	1000+	1000+	1000+	565	610	625	540	540	670	35
192	475	470	470	595	625	665	545	580	535	510	555	550	550	515	1000+	1000+	780	565	565	550	545	500	560	35
198	475	510	500	600	550	650	595	510	580	615	555	535	455	510	1000+	1000+	1000+	590	685	585	560	645	840	40
204	505	500	505	730	685	695	575	605	555	545	560	555	560	545	1000+	1000+	810	590	695	635	585	585	630	35
210	495	515	500	580	620	705	[illegible]	645	605	645	560	555	530	505	1000+	1000+	1000+	630	705	705	[illegible]	605	700	40
216	480	500	485	785	605	625	620	625	610	600	570	565	560	585	1000+	1000+	1000+	680	710	635	640	640	640	35
222	520	520	445	650	700	720	545	590	645	610	580	480	560	1000+	1000+	1000+	1000+	620	595	670	605	555	710	35
228	485	515	425	655	625	640	650	565	595	580	620	585	580	565	1000+	1000+	1000+	620	655	640	615	620	620	35
234	440	450	455	620	615	640	620	640	605	610	605	585	605	615	1000+	1000+	1000+	[illegible]	920	655	615	640	645	35

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min)

TABLE IV 7 FUEL VAPOR CONCENTRATIONS IN PPM

Test 7 Conditions: Fuel - JP-4. Temperature - 75°F. R.H. - 39%. Sample Configuration No. 2. Two gallons of JP-4 in 5-sq ft pan in the center of the room, the run was made for the same purpose as Test 6 using JP-4. 11/10/71.

Time (min)*	Sample Point Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	200	0	0	0	0	10000+	2850	2005	100	150	200	100	50	0	0
6	0	0	0	0	0	0	0	100	50	50	0	0	0	0	10000+	600	950	200	50	50	150	150	100	0
12	120	100	110	175	120	210	225	200	205	170	165	140	160	190	1000+	650	1000+	370	290	280	340	335	280	50
18	195	170	150	180	160	215	215	255	275	255	220	220	185	185	1000+	830	1000+	355	350	370	340	390	445	50
24	240	200	180	335	195	270	255	265	285	270	250	255	215	260	1000+	590	1000+	415	290	340	385	305	430	50
30	260	230	210	335	250	375	290	305	305	290	285	275	270	300	1000+	1000+	1000+	365	330	380	435	485	360	55
36	290	260	230	310	335	355	300	300	355	315	330	265	315	310	1000+	915	1000+	550	370	440	430	420	370	60
42	260	250	240	380	335	365	350	340	340	345	340	350	330	380	1000+	915	1000+	450	370	455	490	475	470	60
48	305	325	315	340	335	355	355	380	360	360	355	340	345	360	1000+	820	745	460	390	420	520	440	480	60
54	345	335	340	410	325	385	400	385	380	395	385	375	35[illegible]	385	1000+	795	735	515	455	455	495	425	560	60
60	345	345	340	360	405	430	405	415	410	385	390	385	385	385	1000+	985	705	450	455	435	445	500	560	65
66	380	370	365	475	450	460	415	415	465	460	405	395	405	415	1000+	815	775	435	375	375	480	510	535	65
72	420	410	400	455	450	475	405	420	415	400	410	355	420	435	1000+	790	835	525	425	490	585	510	575	60
78	410	410	390	400	405	435	430	440	455	455	430	410	430	440	1000+	905	630	665	470	455	445	480	460	60
84	390	395	390	435	460	470	425	450	440	475	420	370	425	435	1000+	970	950	515	490	520	480	540	475	60
90	420	360	365	490	385	490	440	455	525	415	425	420	420	440	1000+	1000+	885	510	430	425	550	445	500	60
96	410	425	415	420	445	405	430	445	450	460	390	410	415	425	1000+	950	1000+	475	455	455	535	545	530	60
102	390	360	350	480	420	455	460	470	480	455	445	415	425	435	1000+	865	1000+	530	480	520	475	445	540	60
108	365	360	340	475	505	480	435	445	460	455	435	425	435	455	1000+	1000+	1000+	500	540	520	505	565	580	65
114	400	420	410	495	480	545	490	480	460	435	435	470	455	490	1000+	1000+	930	535	485	495	570	475	500	60
120	405	430	415	445	440	470	460	515	455	475	495	490	435	460	1000+	905	1000+	515	470	515	535	585	580	60
126	395	395	405	550	555	540	470	455	450	435	445	435	460	460	1000+	690	890	520	510	540	600	505	520	65
132	450	455	440	415	510	485	425	500	485	465	435	455	455	425	1000+	1000+	1000+	625	480	575	605	525	605	60
138	410	415	415	570	540	550	490	530	500	490	470	465	485	495	1000+	840	960	750	665	520	555	645	730	65

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min).

TABLE IV-8. FUEL VAPOR CONCENTRATIONS IN PPM

Test 8 Conditions: Fuel - avgas. Temperature - 72°F. R.H. - 39% Sample Configuration No. 2. Two gallons of avgas in a can suspended 5 ft above the floor just east of the center of the room and allowed to drip steadily. 11/10/71.

Time (min)*	Sample Point Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	250	400	0	0	0	0	1250	1400	700	50	150	50	150	50	100	0
6	0	0	0	50	50	50	100	200	150	750	150	50	300	1950	1650	4500	1850	650	250	300	550	200	200	0
12	50	50	50	200	150	100	390	200	200	350	150	150	2150	4150	2950	6500	5550	950	300	400	550	400	300	0
18	100	150	150	300	350	250	100	200	300	600	200	200	3250	5450	3900	7900	6500	1250	700	300	850	500	350	0
24	300	300	300	450	300	300	200	250	400	800	350	300	5150	6400	5350	9250	7850	2500	850	350	1150	750	750	50
30	400	450	400	350	400	350	350	350	650	1100	500	400	5200	7300	5850	10000+	8900	3000	1300	550	2250	600	550	50
36	550	600	550	450	400	400	400	400	650	1500	450	500	6350	7750	6650	10000+	10000+	2600	1350	800	1600	1150	800	50
42	600	650	650	550	500	450	500	550	900	1300	600	550	5950	7950	7000	10000+	9500	3200	1850	950	2300	1050	800	50
48	700	700	750	550	550	500	600	650	1750	2550	850	650	7200	9200	7800	10000+	9500	2900	2350	1350	2200	750	900	50
54	800	750	900	650	600	650	700	900	2050	1850	1900	1050	6350	8600	7050	10000+	10000+	3250	2500	2050	3200	1200	800	50
60	850	850	750	650	650	650	950	1050	2400	2800	2950	1400	6200	8150	7200	10000+	9850	3700	2800	2900	3350	850	900	50
66	900	850	850	800	750	850	1100	1650	2750	2950	2900	1700	5550	7850	6900	10000+	9250	3400	2750	3000	3400	800	800	50
72	1000	900	900	900	800	850	900	1900	2850	2900	1550	1100	5450	7450	6400	10000+	9900	3350	2300	2100	3050	950	1400	100
78	1000	900	950	950	900	1050	1900	2300	2000	1900	2200	1700	4900	7000	5900	9550	6400	1900	1750	2050	2300	2250	2400	100
84	1050	900	950	1950	1350	1150	2150	2400	2000	1800	2150	1500	3550	5550	4300	8500	4900	2000	2100	2250	1850	2000	2000	100
90	1200	1000	1100	2100	2000	1600	1700	2050	1650	1550	1600	1700	3400	6450	4700	8800	5600	1800	1950	2150	1850	1900	1950	100
96	1350	1300	1350	1900	1650	1750	1650	2100	1700	1650	1850	1700	3250	5300	4500	8800	6550	1850	1600	1850	1700	1750	1750	100
102	1650	1650	1650	1750	1800	1750	1700	1900	1650	1650	1800	1700	4000	4650	4600	8800	6250	2000	1850	1900	2000	1750	1750	100
108	1650	1700	1700	1800	1850	1800	1700	1750	1750	2100	1700	1700	6450	8350	6150	10000+	7700	2650	2100	1950	2600	1850	1800	100
114	1750	1750	1750	1800	1800	1800	1800	2550	2350	2000	2000	1750	4600	6350	5150	9250	8650	2150	1750	2050	2300	1600	2100	100
120	1950	1950	1850	1800	1750	1850	2200	2050	2050	1950	1900	1900	4450	7000	5650	8300	7200	2400	1950	1850	2200	2100	2150	100
126	2000	2000	1900	1900	1850	1850	1900	1950	1950	1950	1900	1950	5700	7500	5050	10000+	8600	3000	2450	2100	2500	2100	2100	100
132	1950	2000	1900	2050	1900	2050	1850	1900	1900	2300	1950	1900	7600	8050	6100	10000+	8000	2950	2250	2000	2250	2050	1950	100
138	2100	2050	2000	1950	1950	2000	1950	2000	2050	2250	2000	2000	7450	8600	7050	10000+	10000+	3200	2550	2100	2900	2100	2150	100
144	2100	2100	2050	2000	2000	1950	2000	2050	2100	2950	2150	2050	6300	9150	7900	10000+	9700	3450	2650	2100	2750	2100	2050	100
150	2150	2300	2100	2100	2000	2000	2100	2100	2150	2500	2150	2100	6900	8500	8200	10000+	10000+	3100	2700	2150	2850	2100	2100	100
156	2200	2300	2150	2150	2100	2100	2100	2150	2500	2400	2200	2200	5300	7550	6300	10000+	10000+	3400	2900	2700	3050	2200	2200	100
162	2250	2450	2200	2150	2100	2150	2200	2200	2200	2500	2300	2200	6850	9200	6550	10000+	9050	3650	2900	2950	3450	2250	2350	100
168	2450	2450	2300	2400	2250	2300	2300	2500	2450	2450	2300	2300	5800	7200	5550	10000+	9550	3300	3000	2950	3100	2350	2450	150
174	2450	2550	2500	2450	2150	2250	2250	2350	2350	2250	2400	2300	4650	6900	5650	10000+	7650	2900	2450	2700	2850	2500	2350	150
180	2550	2500	2450	2400	2400	2350	2350	2450	2450	2550	2450	2450	5150	8000	5150	10000+	8750	3700	2400	2450	3000	2400	2500	150
186	2550	2550	2500	2550	2450	2500	2500	2450	2450	2150	2500	2450	5800	8600	3350	10000+	8550	2650	2500	2350	2650	2400	2350	150
192	2500	2400	2400	2350	2300	2300	2150	2450	2150	2200	2450	2350	5750	7800	6250	10000+	8900	3050	2300	2550	2600	2350	2400	150
198	2500	2500	2500	2350	2350	2400	2400	2500	2450	2300	2500	2450	5600	10000+	7400	10000+	9800	2800	2350	2300	2550	2400	2450	150
204	2500	2450	2500	2400	2350	2400	2150	2400	2100	2150	2500	2250	5450	6950	9300	10000+	7050	2500	2800	2400	2400	2400	2400	100
210	2450	2400	2450	2350	2300	2350	2250	2400	2100	2150	2400	2300	6400	8550	7750	10000+	10000+	2950	2400	2350	2700	2400	2350	100
216	2400	2400	2400	2450	2350	2350	2350	2400	2450	2550	2400	2400	5750	9600	6900	10000+	9900	2850	2550	2550	2700	2450	2450	150
222	2500	2500	2450	2450	2450	2450	2450	2500	2500	2500	2450	2500	5550	8700	6400	10000+	9350	2900	2500	2750	2900	2500	2550	150
228	2600	2550	2550	2550	2500	2500	2400	2550	2500	2550	2500	2500	4850	7400	6700	10000+	5350	2850	2550	2500	2750	2550	2600	150
234	2550	2550	2550	2600	2550	2550	2500	2700	2450	2400	2600	2450	5050	7050	5900	10000+	4950	3000	2600	2450	2900	2600	2550	150
240	2500	2550	2550	2700	2600	2550	2550	2600	2500	2500	2600	2550	4500	6450	6250	9300	8000	3050	2300	2450	2800	2800	2550	100
246	2550	2550	2550	2650	2600	2600	2550	2750	2650	2700	3000	2200	4900	6700	6200	10000+	6000	2250	2550	2500	2500	2600	2700	150
252	2550	2550	2600	2550	2600	2550	2300	2300	2500	2400	2200	2100	4450	5800	5550	8050	4100	2450	2600	2500	2550	2600	2550	150
258	2700	2650	2600	2550	2550	2450	2250	2300	2700	2600	2200	2200	2150	2000	4000	6700	4700	2300	2250	2250	2250	2350	2450	100
264	2500	2450	2500	2450	2500	2500	2300	2350	2150	2100	2350	2200	2200	2000	3250	4850	4800	2250	2350	2300	2250	2350	2350	150
270	2400	2450	2400	2350	2400	2450	2200	2250	2350	2150	2250	2100	2100	1900	3300	4800	2750	2650	2200	2300	2350	2300	2350	100
330	1650	1650	1650	1650	1700	1700	1450	1400	1450	1400	1400	1300	1250	1200	1550	1400	2150	1400	1350	1300	1350	1500	1450	0
390	850	800	800	900	900	900	800	750	800	750	750	750	700	650	750	700	1300	750	750	750	800	850	850	50
450	500	500	500	500	500	500	500	500	500	500	450	500	400	400	550	500	1050	500	500	500	500	550	500	50
510	300	300	300	300	300	300	250	250	250	250	250	250	200	200	300	250	300	250	250	250	250	300	250	0
570	150	150	150	150	150	150	150	150	150	150	150	150	150	150	200	150	150	150	150	150	150	150	150	0
630	100	100	100	100	100	100	100	100	100	100	100	100	100	100	150	100	100	100	100	100	100	100	100	0
690	100	100	100	100	100	100	50	50	50	50	50	50	50	50	150	100	100	100	100	100	100	100	100	0
750	50	50	50	50	50	50	50	50	50	50	50	50	50	50	100	50	50	100	50	50	50	50	50	0
810	50	50	50	50	50	50	50	50	50	50	50	50	50	50	100	50	50	50	50	50	50	50	50	0

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min).

TABLE IV 9 FUEL VAPOR CONCENTRATIONS IN PPM

Test 9 Conditions: Fuel - JP-4. Temperature 54°F R.H. - 77%. Sample Configuration No. 2. Two gallons of JP-4 in a can suspended 5 ft above the floor just east of the center of the room and allowed to drip steadily. 11/11/71.

Time (min)*	Sample Point Numbers																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	0	250	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	200	0	450	0	0	0	0	100	110	0
12	115	135	135	85	80	75	70	75	75	70	75	70	60	60	785	140	735	130	115	125	135	240	190	0
18	200	225	225	145	145	170	150	155	220	290	175	175	200	160	730	220	765	255	240	240	265	305	290	25
24	330	340	360	255	235	245	230	245	255	235	260	240	240	230	795	310	695	345	265	320	345	310	345	20
30	425	395	385	325	320	340	310	335	335	375	345	315	360	285	1000+	470	560	435	360	435	400	500	485	20
36	515	480	485	420	400	400	385	410	425	460	415	405	440	385	1000+	520	670	490	465	480	475	635	590	30
42	640	610	600	530	515	520	475	485	495	500	485	495	[illegible]	510	1000+	690	1000+	590	600	595	615	710	605	35
48	720	690	700	635	605	580	575	580	585	500	575	580	605	585	1000+	1000+	1000+	615	580	650	650	775	760	40
54	790	750	735	680	535	670	630	630	720	685	625	585	670	660	1000+	1000+	1000+	660	675	660	670	700	660	50
60	745	690	710	690	705	695	665	680	645	865	670	630	700	570	1000+	1000+	935	710	665	665	740	905	735	55
66	835	730	750	740	740	730	705	725	705	685	705	680	720	715	1000+	1000+	880	785	680	770	780	935	785	60
72	850	790	800	780	760	745	725	750	690	660	730	625	745	575	1000+	1000+	735	690	645	700	870	900	750	0
78	700	700	650	700	650	650	600	650	650	700	650	600	650	600	1200	1450	800	700	600	600	700	800	800	0
84	700	650	650	750	700	700	650	650	650	650	650	650	700	650	1300	1800	1050	750	650	700	800	1000	800	0
90	700	700	700	800	700	750	700	700	700	650	700	650	700	700	1450	1300	1000	750	700	750	750	950	800	0
96	650	650	650	750	750	700	600	700	500	600	650	650	700	700	1700	1200	1150	750	700	700	800	900	800	0
102	650	650	600	700	700	700	700	700	800	750	700	700	750	750	1500	1600	1550	800	700	750	800	850	850	0
132	700	700	650	850	800	850	750	800	750	750	750	700	750	750	1300	1650	1400	850	800	800	850	1000	950	0
162	600	600	600	750	750	800	750	800	750	800	750	700	700	750	1350	2150	850	900	800	850	900	950	800	50
192	650	600	600	950	900	950	900	900	950	750	850	800	850	800	1650	1950	1100	900	850	850	1000	900	900	50
222	500	550	500	900	900	900	900	900	1050	750	850	800	850	800	1200	2150	750	800	750	800	[illegible]	1050	950	50
252	500	450	400	850	850	850	850	850	850	850	850	800	800	750	950	3350	850	900	950	850	[illegible]	1050	900	50
282	600	600	600	950	950	900	950	1000	850	850	800	700	850	850	1250	3700	950	1000	1000	900	1000	1000	1050	50
312	550	600	550	900	850	950	850	850	950	950	[illegible]	800	700	800	1200	2900	1050	950	1000	1050	900	950	850	0
342	400	400	350	700	650	700	650	700	700	700	650	600	650	700	700	950	750	700	800	750	700	800	650	0
372	250	350	350	550	450	600	550	500	500	500	550	500	500	550	600	650	650	550	550	550	550	550	600	0
402	200	200	200	350	400	450	350	350	350	350	350	350	350	350	400	400	650	400	350	400	400	400	400	0
432	150	200	150	300	350	300	300	300	300	300	300	300	300	350	300	450	350	300	350	400	400	400	350	0
462	150	200	150	250	250	250	250	250	250	250	250	250	250	250	300	250	350	250	250	250	300	250	300	0
492	150	150	150	200	250	285	285	310	285	275	285	275	280	290	375	295	395	320	280	290	350	330	340	30
522	270	290	250	320	320	325	345	325	325	325	325	315	320	410	335	455	355	325	320	380	340	340	340	60
552	335	335	325	335	350	360	305	340	320	325	310	320	345	345	420	340	570	355	330	335	410	320	340	75
582	270	290	290	265	275	285	295	300	300	300	295	295	280	285	380	305	455	330	320	325	340	270	290	75
612	270	260	265	265	265	260	255	250	255	260	260	260	260	260	350	260	330	290	255	265	275	280	270	75
642	235	240	245	240	250	245	240	245	245	245	245	240	245	245	340	245	360	255	250	255	255	265	260	70
672	225	225	230	225	225	225	220	220	220	220	220	220	225	225	310	230	415	235	225	230	235	220	225	65
732	190	195	195	200	200	200	190	190	190	185	190	185	190	190	255	200	245	200	195	200	200	210	205	60
792	175	190	190	185	185	185	185	185	185	180	185	180	185	165	215	185	205	190	185	190	190	190	190	55
852	115	120	125	120	120	120	115	120	120	115	120	115	105	90	150	115	180	125	125	120	135	135	130	0
912	95	100	105	105	105	105	105	100	100	100	100	100	90	80	135	105	135	115	105	110	110	110	115	5
972	80	80	85	85	85	85	85	80	80	80	80	80	70	70	105	85	85	110	85	85	90	85	90	0
1032	65	65	70	65	65	65	65	60	65	60	65	65	55	55	90	70	85	75	70	70	75	75	75	0
1092	55	50	60	60	60	60	60	60	60	55	55	55	50	45	85	65	60	65	60	60	65	65	65	0
1212	40	40	45	45	40	40	40	40	40	40	40	40	35	30	50	40	50	45	40	40	45	45	45	0
1380	20	25	25	25	25	25	25	20	20	20	20	20	20	15	35	20	30	30	20	20	25	25	25	0

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min)

TABLE IV-10. FUEL VAPOR CONCENTRATIONS IN PPM

Test 10 Conditions: Fuel - JP-4. Temperature - 71°F. R.H. - 87%. Sample Configuration No. 2. Four gallons of JP-4 in the same location as Test 9. 11/15/71.

Time	Sample Point Number																							
(min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	50	0	0	0	0	300	150	1600	200	0	0	250	100	50	50	100	0
6	0	0	0	50	100	150	50	200	250	200	150	250	1000	900	1950	2250	150	250	300	300	200	150	200	0
12	150	150	100	250	200	250	200	100	200	250	200	150	1800	2450	1000	1750	250	250	350	250	350	300	400	0
18	250	250	250	300	300	350	250	250	300	550	400	300	1350	1450	1550	2900	500	400	350	300	450	500	450	0
24	350	350	400	350	350	350	300	500	500	650	450	500	2350	1500	2800	4700	2850	900	450	450	400	600	600	0
30	450	450	500	500	350	450	450	500	600	550	550	550	1750	1250	2000	3600	400	400	600	650	450	500	550	0
36	450	450	450	500	550	550	500	500	500	600	550	500	1650	3150	3700	3300	2700	700	550	550	750	600	550	0
42	500	450	500	500	500	500	550	600	500	500	600	500	2750	2700	3200	4100	2450	750	600	550	650	750	650	50
48	650	650	600	600	550	550	550	650	550	650	700	600	2650	2950	3300	5050	1600	850	600	650	750	750	700	50
54	650	650	650	700	650	650	600	800	650	650	900	700	2200	2950	2750	4700	445	900	900	800	850	800	700	50
60	700	700	750	800	750	700	750	750	800	800	850	800	3150	2800	3850	5100	1550	950	800	800	850	800	850	50
66	700	750	700	750	750	750	750	900	750	850	900	800	2450	3600	4400	4450	1800	850	800	850	850	800	800	50
72	750	750	750	750	800	750	800	800	800	800	850	750	1950	3250	2950	4700	1500	800	900	800	750	750	800	50
78	700	750	750	800	750	800	800	850	850	800	850	750	3400	4300	3750	3100	3600	900	850	850	850	750	800	50
84	650	700	650	800	800	800	800	850	850	800	950	800	2200	2400	3850	3750	2600	900	900	850	850	850	850	50
90	650	700	700	800	800	800	800	850	800	800	850	800	2750	2800	4000	4300	950	700	850	800	900	850	850	50
96	700	700	750	800	850	800	750	900	750	800	850	800	2450	2300	3850	4600	1000	900	1000	1050	950	900	950	50
102	750	750	800	850	850	800	850	850	850	900	850	800	3350	2650	3250	4350	2100	1050	900	850	900	850	850	50
108	700	750	700	800	750	800	800	850	800	800	900	800	2850	2500	2900	4900	1850	1050	900	950	600	800	800	50
132	500	600	600	700	650	650	700	750	700	750	750	650	2600	1300	3350	3050	2250	750	800	750	650	650	750	50
168	650	700	700	800	800	800	750	850	800	800	850	800	2200	1900	4650	3350	3450	950	800	750	800	850	850	50
228	500	550	550	650	750	800	650	700	700	700	750	600	3000	1250	1850	3750	900	600	950	850	750	650	650	50
288	450	450	450	650	650	650	600	650	650	650	700	650	1200	1650	1900	3600	650	600	750	750	600	550	600	50
348	400	450	450	500	500	500	500	550	550	600	550	600	1100	1650	1600	2050	400	450	900	550	400	450	500	50
414	350	400	350	450	450	500	500	500	550	550	550	550	1000	600	1250	2000	500	400	700	450	400	400	500	0
486	550	550	550	650	550	700	800	850	950	900	800	800	1600	2450	1600	5200	3350	1050	1050	950	900	650	650	50
570	250	300	300	300	250	300	300	300	400	450	350	350	600	900	1050	1900	300	250	450	350	250	250	250	0
690	100	100	100	100	100	150	150	100	150	150	150	200	200	250	400	400	150	100	100	150	100	100	100	0
876	65	70	70	75	75	70	75	65	100	110	70	70	70	55	295	135	70	75	80	80	75	80	80	20
1056	50	50	55	60	60	60	50	45	65	65	45	40	45	35	85	65	50	55	50	55	60	60	55	15
1236	35	40	40	45	45	50	40	35	50	45	30	35	30	20	75	45	30	40	40	45	45	40	40	10
1398	30	30	30	35	35	35	30	30	30	20	20	20	20	20	25	20	15	15	15	15	15	10	10	0

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min).

TABLE IV-11. FUEL VAPOR CONCENTRATIONS IN PPM

Test 11 Conditions   Fuel – avgas   Temperature – 79°F   R.H. – 62%   Sample Configuration No. 2   Four gallons of avgas in the same location as Test 8   11/15/71

Time (min)*	Sample Point Number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	5	5	5	15	10	10	10	10	45	20	25	15	565	50	2150	1900	800	150	150	0	100	50	200	0
6	0	0	0	50	100	150	350	450	400	250	350	150	2350	1550	2500	3250	1100	550	350	350	400	400	400	0
12	50	50	50	350	350	300	350	700	400	350	700	600	3150	4200	2550	2050	2750	1150	700	600	550	600	650	0
18	200	250	250	750	750	700	700	800	700	700	800	700	2150	2550	3350	3450	650	750	1000	800	900	800	750	0
24	350	400	400	700	750	650	700	850	800	800	950	700	1050	3300	3850	5150	2750	700	950	900	750	850	750	0
30	450	500	500	800	850	850	800	850	850	800	1500	1100	2850	4000	4450	4500	700	800	1150	1150	800	850	850	50
36	650	700	700	900	850	900	900	950	950	950	2250	1450	3550	3550	4550	6900	3450	1050	1250	1150	1050	900	900	50
42	750	800	750	950	850	950	1000	950	1000	1100	950	900	2750	3650	3550	6050	1100	1000	1300	1050	950	900	650	50
48	650	800	750	900	850	900	950	1050	1000	1050	1150	900	2150	3350	3350	5200	3550	1250	1400	1200	1050	1000	950	50
54	750	750	750	950	1050	950	1050	1150	1100	1150	1200	1100	2600	3450	4400	5050	5450	1400	1250	1200	1150	1000	1000	50
60	650	750	750	1000	1000	1000	1100	1250	1050	1200	1300	1250	3350	3750	3100	7650	1000	900	1250	1300	1100	900	900	50
66	800	900	850	1050	1000	1050	1100	1350	1150	1150	1200	1100	2900	3800	3000	5550	5850	1250	1450	1300	1350	1200	1150	50
72	800	850	850	1100	1000	1100	1100	1150	1300	1200	1150	1100	3200	3650	2250	6150	4250	1400	1400	1250	1200	1050	1100	50
78	800	900	800	1050	1000	1050	1050	1050	1150	1100	1250	1050	3350	3400	3100	6300	3550	1250	1250	1200	1250	1100	1050	50
90	900	950	900	1050	1000	1100	1200	1350	1550	1350	1100	1100	2200	3850	3200	5450	800	900	1550	1300	950	950	1100	50
102	850	850	850	1000	950	1050	1100	1050	1150	1150	1050	1000	2750	3000	4550	5750	2500	1250	1450	1200	1100	1000	1050	50
108	750	850	850	950	950	1000	1150	1050	1200	1200	1250	1150	2750	4000	3900	7250	3550	1350	1500	1300	1200	1150	1200	100
114	850	900	900	1000	1050	1050	1150	1200	1200	1650	1350	1350	2300	2700	3900	6200	1250	1550	1550	1350	1100	1050	1100	50
120	900	950	950	1050	1050	1100	1200	1200	1300	1250	1150	1100	2200	3650	2800	6750	2300	850	1150	1050	1000	900	1000	50
126	800	900	850	950	900	1000	1200	1200	1200	1200	1150	1150	4100	1700	3250	6500	3650	1550	1400	1400	950	1050	1100	50
132	750	800	800	1050	1000	1050	1100	1100	1200	1150	1250	1100	4100	3700	3350	7600	1150	1700	1350	1400	1250	1100	1100	50
138	850	850	850	1000	1000	1000	1150	1200	1200	1100	1150	1200	2200	3100	3850	6650	1350	1350	1450	1350	1000	1050	1200	50
144	850	900	850	1000	1000	1050	1150	1100	1250	1150	1150	1100	4100	3500	3400	5600	1100	900	1400	1350	1300	1000	1100	100
150	900	1000	850	1050	1050	1050	1150	1150	1200	1200	1300	1150	4750	6700	3950	6050	900	800	1550	1500	1350	1200	1100	100
156	900	950	900	1100	1050	1100	1200	1150	1200	1300	1300	1250	2800	5150	4300	6800	5500	1700	1650	1650	1300	1150	1150	100
162	950	950	950	1000	1100	1100	1200	1350	1400	1400	1050	1250	4050	6150	3900	9250	5350	1750	1700	1500	1000	1250	1200	100
168	1000	1050	1050	1200	1200	1200	1350	1350	1500	1450	1400	1350	3100	4750	3900	8050	3000	1300	1550	1450	1300	1350	1250	100
174	1050	1100	1100	1200	1200	1200	1250	1850	1500	1450	1350	1400	2450	4550	2800	5900	1450	1050	1550	1450	1400	1250	1250	100
180	950	1100	1000	1150	1100	1200	1250	1400	1300	1350	1300	1300	2350	3050	3650	6350	3100	1450	1600	1450	1350	1200	1250	100
186	1050	950	1000	1150	1100	1200	1250	1250	1350	1400	1300	1300	3250	3250	4100	7550	4500	1450	1500	1400	1200	1150	1150	100
192	1050	1050	1050	1150	1150	1150	1200	1300	1250	1250	1400	1400	3350	4250	4550	8800	5700	1500	1500	1400	1500	1200	1150	100
198	950	1000	950	1200	1200	1100	1300	1350	1400	1350	1600	1350	3300	5900	5350	8050	3750	1600	1650	1450	1550	1150	1250	100
204	950	1050	1000	1200	1200	1200	1350	1350	1450	1400	1350	1400	3250	6650	4650	8300	3350	1900	1500	1500	1650	1450	1350	100
210	1050	1050	1000	1250	1300	1250	1350	1450	1450	1500	1500	1450	3800	6000	3500	6250	1300	1150	1550	1600	1250	1250	1200	100
216	1000	1050	950	1150	1100	1100	1250	1200	1350	1450	1300	1250	2850	3600	3750	6250	2250	1000	1500	1300	1200	1100	1200	100
222	1000	1000	1000	1100	1050	1100	1250	1200	1300	1400	1350	1250	2450	3450	5400	7300	1400	1100	1600	1450	1200	1100	1050	100
228	1000	1050	950	1100	1050	1100	1200	1250	1350	1350	1450	1200	3400	4650	3900	8400	1500	1150	1550	1400	1300	1200	1100	100
234	1000	950	900	1150	1150	1150	1200	1250	1350	1550	1450	1300	3250	2050	3800	6900	4150	1550	1650	1500	1200	1100	1150	100
240	950	950	950	1150	1000	1100	1200	1300	1350	1350	1200	1300	2500	3500	3250	7100	3100	1600	1500	1400	950	1000	1100	100
246	900	950	950	1100	1000	1050	1200	1150	1250	1200	1200	1150	2450	3500	3000	4400	1000	950	1250	1200	1000	1000	1050	50
252	800	900	900	1050	950	1050	1150	1100	1200	1450	1350	1100	3050	2050	2450	5800	3300	1150	1400	1250	1100	950	900	50
258	750	850	850	1000	850	950	1050	950	1150	1250	1100	1200	3550	5300	2500	9450	4250	900	1150	1200	800	950	950	50
264	800	800	800	950	950	950	1100	1100	1250	1250	1150	1150	2950	6000	2850	8250	4700	1550	1250	1250	1050	950	1000	100
270	800	800	800	1000	1000	950	1200	1150	1250	1300	1250	1200	2600	3950	3200	7900	3050	1300	1300	1250	1300	1050	1000	100
276	800	800	800	1000	1000	1000	1150	1200	1250	1300	1350	1350	2600	5550	3300	7100	1050	950	1450	1450	1200	1050	1000	100
282	750	800	800	1050	1000	1000	1200	1250	1350	1350	1200	1250	3450	4300	3700	4950	5450	1450	1500	1300	850	950	950	50
288	800	850	850	1050	950	1000	1200	1200	1250	1250	1200	1200	3350	6000	4000	6450	3300	1250	1350	1250	1200	1050	1100	100
294	850	850	850	1100	1050	1000	1200	1250	1300	1350	1250	1200	3800	4850	2050	7450	3850	1550	1450	1400	1050	1000	1000	100
300	800	800	800	1050	1050	1050	1200	1200	1300	1300	1300	1300	2600	6100	3350	6950	4700	1150	1350	1300	1150	1100	1050	100
306	850	900	900	1050	1050	1100	1250	1350	1350	1350	1300	1450	2350	4000	4500	5950	3450	1150	1400	1200	1300	1050	1050	100
312	850	950	850	1050	1050	1050	1300	1300	1400	1350	1350	1300	2400	3700	2800	7400	3050	1150	1550	1400	1050	1100	1200	100
318	850	900	900	1050	1050	1000	1150	1150	1250	1250	1200	1200	2550	3500	3300	8100	3550	1100	1300	1200	1100	1000	1000	50
324	850	900	900	1050	950	1000	1200	1300	1300	1300	1350	1400	3050	6650	3500	8750	3700	1100	1450	1250	1100	1000	1000	100
330	850	900	850	1100	950	1000	1150	1200	1300	1250	1450	1200	2050	3350	2900	5950	800	800	1400	1300	850	1050	1000	50
336	900	950	950	950	950	1000	1100	950	1200	1250	1100	1050	2550	4450	2800	7800	5150	1750	1400	1150	1150	950	950	100
342	800	850	850	950	950	900	1200	1250	1350	1550	1300	1300	3200	4500	3300	7300	1350	1050	1600	1300	800	950	1050	100
348	750	800	800	1000	950	1050	1150	1150	1300	1350	1200	1200	2600	5500	2250	6400	4600	1400	1400	1300	1150	900	950	50
384	750	800	750	900	800	950	950	1050	1100	1050	1000	1100	2850	4750	3150	7700	1200	800	1400	1050	900	900	750	50
426	700	750	750	800	750	750	950	850	1150	1300	1100	1150	1900	2700	2000	3750	3300	1000	1150	1150	950	850	800	50
480	850	850	850	1400	1500	1400	1850	1900	2200	2250	2050	2300	7650	10000+	6000	10000+	6000	3100	2550	2300	2100	1500	1500	100
516	850	900	900	800	600	800	700	900	900	900	650	900	1800	3350	1650	3300	450	450	850	750	600	700	600	50
600	250	250	250	300	300	300	250	250	400	450	250	200	300	800	450	1550	200	150	200	200	250	250	200	0
900	50	50	50	50	50	50	50	50	50	50	50	50	50	0	150	50	50	50	50	50	50	50	50	0
1182	20	20	25	35	30	30	20	20	35	35	25	20	15	15	65	30	25	20	25	20	20	25	30	0

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec or 5 min)

TABLE IV 12 FUEL VAPOR CONCENTRATIONS IN PPM

Test 12 Conditions: Fuel - avgas. Temperature - 52°F. R.H. - 50%. Sample Configuration No. 3. Four gallons of avgas in a spill at the center of the east wall. 11/19/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	100	100	100	100	100	100	100	100	200	600	1700	400	5200	20000+	1700	20000+	7900	2900	3100	2400	1800	900	1300	300
4	800	500	600	700	500	700	1800	2400	2600	4300	4100	5700	17600	16400	16000	20000+	12300	7000	4900	4300	3300	1600	1500	400
8	1300	700	800	1500	1400	1600	2700	2500	4100	5400	3800	4600	11900	20000+	16500	20000+	12100	3500	6100	4400	5200	2500	2400	400
12	1800	1000	1000	1900	1800	2100	1600	2300	3200	4600	3100	2900	15200	16900	14500	20000+	12300	5900	4100	4000	3500	3300	2800	400
16	2100	1700	1600	2200	1600	2400	1600	2700	3000	2500	2700	2200	5800	7900	9300	16500	5900	3700	3300	2600	2400	3200	2600	400
20	2400	2400	1900	2100	2000	2300	2000	[illegible]	2100	1800	2600	1800	5900	2000	4400	10000	4400	3000	2600	2300	2200	[illegible]	2100	300
24	2400	2500	2400	2100	2400	2100	1900	2700	2000	1900	2100	1800	5200	1900	2700	8200	4250	3450	2850	2550	2500	[illegible]	1950	200
28	2350	2250	2300	2000	2000	1900	1600	1800	1800	1600	1650	1600	1800	1350	2050	7250	5050	2250	2650	2250	2100	1850	1950	200
32	2200	2200	2200	1700	1600	1750	1650	1550	1700	1700	1550	1550	1550	1150	2100	7350	3550	2050	2400	2150	2100	2550	1750	200
36	2250	2250	2200	1650	1500	1600	1500	1500	1600	1400	1500	1400	1350	1150	1950	3400	4050	1600	2000	1850	2150	2150	2350	200
40	2050	2100	2100	1600	1600	1600	1600	1600	1600	1600	1600	1500	1650	1150	1650	2500	3600	1700	2100	2350	1700	2050	2000	200
44	1950	2050	2050	1600	1600	1650	1500	1650	1550	1450	1650	1400	1650	1250	1700	1700	3550	1700	1700	1850	1600	1650	1900	150
48	1900	1850	1900	1700	1650	1700	1600	1600	1600	1400	1500	1400	1550	1150	1400	1550	3450	1750	1550	1550	1450	1450	1650	150
52	1600	1550	1650	1600	1550	1550	1500	1550	1500	1400	1450	1350	1500	1200	1450	1750	1950	1500	1400	1450	1400	1650	1600	150
56	1500	1550	1500	1450	1400	1550	1250	1400	1350	1350	1350	1250	1350	1050	1300	1350	3500	1350	1200	1100	1500	1300	1300	100
60	1300	1350	1350	1350	1350	1400	1100	1350	1200	1100	1300	1100	1350	900	1050	1250	1450	1200	1250	1150	1200	1150	1150	50
180	450	450	450	450	500	450	350	450	400	400	450	400	450	300	400	435	710	460	410	455	430	460	435	40
270	335	355	350	335	335	340	270	315	300	295	325	280	330	265	345	330	385	305	300	310	425	330	310	35
360	290	300	305	310	295	305	260	260	260	250	275	255	290	285	295	285	315	290	290	285	355	285	285	40
450	215	215	215	215	215	215	210	205	205	185	195	165	205	120	155	185	445	270	200	200	170	225	205	20
504	150	150	150	220	220	220	210	210	205	200	210	160	200	150	180	200	310	180	195	200	230	225	200	25

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV 13 FUEL VAPOR CONCENTRATIONS IN PPM

Test 13 Conditions: Fuel - avgas. Temperature - 98°F R.H. - 79%. Sample Configuration No. 3. Same as Test 12 but at a higher room temperature. 11/22/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	400	500	700	1100	18000	20000+	20000+	20000+	11400	3800	4900	2900	1400	500	500	500
4	1300	400	200	100	100	400	6100	5200	7000	7100	5300	6400	15600	20000+	20000+	20000+	15300	5700	6800	8000	6100	1300	1000	600
8	1600	600	400	400	300	300	6700	6500	8500	9300	6400	7900	13000	20000+	20000+	20000+	20000+	7500	7100	7700	7200	1700	2700	800
12	1900	700	600	1700	900	1000	7200	6000	8600	8200	6600	9300	1420	20000+	20000+	20000+	12400	6700	7600	8300	7400	3500	6700	1100
16	2300	1000	800	3800	4000	3700	6600	6900	7400	7000	6500	8800	17100	20000+	20000+	20000+	1900	7000	10000	9200	7600	5700	7300	1300
20	2800	1400	1300	4500	2400	4600	7200	5300	7800	7100	5800	8600	13100	20000+	20000+	20000+	13600	5400	8200	7500	6100	5400	7100	1200
24	2900	1800	1700	5100	3800	4900	7100	5800	6000	5400	5200	6800	11400	20000+	17800	20000+	10500	4800	7200	7000	6500	6000	7000	1100
28	4100	2400	2500	5700	5400	5500	5500	4500	5600	5900	5000	5300	10100	18900	15100	20000+	9800	3700	6600	6200	5600	5800	6200	1000
32	3900	3000	3300	5800	3600	3700	5200	5400	5800	5600	4800	4300	9800	15900	15000	20000+	3600	3800	4500	4800	4500	5500	6000	1000
36	2200	3400	3500	5300	4800	[illegible]	5000	4200	4600	4700	4100	4000	9500	13200	13300	19800	5400	3200	3900	4400	4100	5300	5600	900
40	4000	3800	3800	4000	3700	3400	4800	4800	5100	4900	4700	4500	6500	13500	12400	19600	4900	4700	5000	4300	4600	4200	4600	800
44	3900	3800	3700	3100	3400	3000	4600	4400	4800	4300	4000	4000	6200	11400	12700	16800	2600	4000	3900	4000	3600	3700	4100	800
48	3600	3400	3500	3600	3400	3400	3900	4100	4100	3800	3800	3500	4700	10300	9100	15900	5400	4000	3200	3800	4300	3700	3500	700
52	3600	3500	3500	3200	3300	3000	3600	3300	3700	4000	3600	3200	6700	10000	10900	16000	5500	2700	3200	3200	3700	3500	3700	700
56	3400	3400	3300	3300	3300	3200	3300	3300	3300	3100	2900	2800	5300	10400	9500	14500	1800	2700	3000	2900	2500	3200	3600	700
60	3100	3000	2900	3400	3100	3200	3100	3000	3300	3200	3200	2900	4100	10500	9800	13300	3200	2400	3200	3100	3000	3600	3500	600
68	3000	3100	2900	2600	2700	2600	3000	2900	2900	2700	2700	3000	4800	8700	8600	12500	1800	2300	3000	2600	2600	2900	3100	600
72	2700	2700	2600	2700	2700	2800	2100	2300	2900	2700	2400	2900	4700	6600	10400	15100	5200	3000	3500	3200	2600	2900	2800	600
76	2900	2800	2800	2600	2600	2200	2700	2300	2700	3300	2900	2200	3200	9400	8200	11900	4800	3800	3600	2800	2600	2600	2500	500
144	1800	1800	1700	1800	1700	1600	1800	1400	2000	1900	1900	1500	1600	4700	4100	7300	1100	1800	2300	2000	1700	1600	1700	300
204	1800	1900	2000	2100	2100	2200	2000	1900	1800	1700	1700	1900	1500	2200	3100	2000	1400	1800	1700	1700	1800	2100	1800	300

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-14. FUEL VAPOR CONCENTRATIONS IN PPM

Test 14 Conditions: Fuel - JP-4. Temperature - 97°F. R.H. - 85%. Sample Configuration No. 3. Four gallons of JP-4 in a spill at the center of the east wall. 11/23/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	200	0	200	300	0	16000	20000+	5600	2200	2500	1200	700	400	700	400
4	700	200	100	400	100	700	300	600	1600	2900	1600	600	3700	14700	11600	18000	9700	3100	4400	2600	1600	2000	1600	700
8	1400	1100	600	1100	1200	1200	1000	1000	2500	2300	1900	1600	2900	12800	9900	14200	5900	3900	3700	3200	2200	2000	2000	700
12	1800	1600	1200	1700	1800	1800	1800	1700	2500	2500	2200	2100	3400	1900	6300	13100	4800	2900	2500	2400	2200	2300	2500	700
16	2200	2200	1900	2100	1800	2000	2200	1900	2600	2500	2300	1800	2100	1700	5600	12600	6200	2900	4100	2800	2900	2500	2500	700
20	2400	2300	2200	2100	2100	2000	1900	1800	2100	1800	1700	1700	1600	1600	3000	4900	4300	2600	3100	3100	2700	2800	2900	700
24	2400	2700	2600	2400	2300	2300	1900	1700	1800	1800	1700	1900	1800	1700	2400	2600	4200	2400	2200	2100	2200	2400	2400	500
28	2050	1950	1900	1900	1900	1850	1600	1450	1500	1450	1400	1400	1350	1300	1700	1800	2400	2000	1650	1700	1750	2000	1800	400
32	1600	1700	1750	1850	1800	1750	1650	1450	1450	1400	1350	1400	1300	1250	1500	1600	2850	1800	1550	1500	1650	1800	1650	400
36	1400	1550	1550	1650	1700	1600	1550	1400	1400	1400	1350	1350	1300	1200	1550	1600	2650	1750	1500	1500	1550	1800	1600	400
40	1400	1550	1500	1600	1650	1600	1400	1300	1300	1300	1250	1250	1200	1150	1300	1450	2100	1550	1400	1400	1500	1650	1500	400
108	800	850	900	900	950	900	850	800	800	800	750	750	700	700	800	800	900	850	800	850	850	900	850	300
168	430	495	500	510	515	515	500	455	455	455	445	445	420	400	485	500	460	470	485	500	500	485	490	175
228	340	390	400	410	410	410	390	360	360	360	350	340	315	305	340	350	430	380	365	365	400	425	485	140
252	285	320	325	335	345	340	320	295	290	280	275	270	255	245	280	290	345	345	295	300	320	335	305	120

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-15 FUEL VAPOR CONCENTRATIONS IN PPM

Test 15 Conditions: Fuel - avgas. Temperature - 52°F. R.H. - 74%. Sample Configuration No. 3. Four gallons of avgas in spill at the center of the east wall. 12/1/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2200	10000	1750	500	300	200	700	150	150	300
4	350	150	150	0	0	0	650	1150	1350	2450	1600	700	14400	16000	14200	20000+	9800	2900	4600	2600	2700	1600	1400	1000
8	1500	600	600	900	900	1100	2600	2300	3600	3200	3200	4000	11800	13100	13000	20000+	6800	4000	4100	3600	2900	2100	1900	900
12	1600	800	600	1500	1500	1700	1800	2000	3000	2700	2200	1700	9900	12300	12500	19500	9900	3400	4100	3300	3100	1900	2000	900
16	2100	1500	1000	1800	1700	1800	1600	2200	2600	2500	2900	2400	7000	12700	11200	14300	8600	4600	3600	3600	3600	2400	2500	900
20	2200	1600	1500	1600	1700	1900	2200	2800	3400	3200	3000	3000	5900	8200	9400	14600	7500	3400	2900	2700	2800	2100	2500	700
24	2300	1800	1700	1700	1800	2100	1800	2200	2800	2700	2500	2200	5300	6500	7300	11600	5000	2900	2400	2400	2200	2100	2100	600
28	2300	1900	2000	1900	1800	2000	1900	2200	2400	2200	2400	1500	2600	2200	6000	8900	5800	2600	2700	2400	2300	2600	2400	600
32	2400	2300	2200	1800	1600	1900	1600	1900	2400	2100	2600	1900	2400	3200	5700	9900	4500	2700	2600	2300	2400	2100	2000	600
36	2400	2300	2200	1900	1800	1900	1700	2100	2100	2000	1900	1500	3700	6700	6000	10100	5100	2700	2100	1900	2100	2300	2000	600
40	2300	2100	2100	1900	1800	1800	1500	2000	1900	1500	1900	1400	3700	2000	4300	6900	5300	2400	1900	1800	1600	2000	1800	500
44	2100	2000	2000	1900	1700	1600	1500	1800	1700	1600	2100	1500	3100	1500	5000	6700	2800	2350	2350	2150	2250	1850	1800	400
48	2100	2150	2100	1750	1750	1650	1600	1800	1750	1600	1800	1600	2450	1500	2250	6000	2400	2150	2150	2350	2000	1750	1800	500
52	2150	2150	2100	1700	1650	1600	1500	1700	1550	1450	1450	1500	2200	1200	1850	5250	3050	2200	1900	2000	1900	1750	2000	350
56	1850	1950	1950	1600	1450	1500	1500	1450	1350	1400	1400	1250	1350	1000	1800	3850	2650	2150	2000	1950	2350	1900	2050	350
60	1900	2000	2000	1500	1350	1400	1300	1200	1250	1200	1300	1150	1300	900	1300	2200	2200	1800	1500	1450	1600	1650	1750	150
150	850	900	900	900	900	900	800	850	800	750	800	750	650	550	750	800	1800	1100	800	800	850	1050	800	50
246	420	435	440	470	480	470	430	410	410	395	410	395	370	325	390	410	440	435	415	415	475	525	440	30

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-16 FUEL VAPOR CONCENTRATIONS IN PPM

Test 16 Conditions: Fuel - avgas. Temperature - 60°F. R.H. - 78%. Sample Configuration No. 3. Ten gallons avgas in large spill at the center of the east wall. 12/2/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	100	400	300	100	11600	20000+	20000+	20000+	11200	2000	1800	1400	1400	500	700	800
8	1400	600	400	300	300	300	600	1600	1800	1500	1300	500	7100	14600	12600	20000+	5000	1600	1700	1400	800	600	1000	1300
12	1400	700	600	700	400	600	400	700	1200	600	1000	500	5300	14900	13100	19500	4200	1100	1900	1400	800	800	1100	1000
16	1600	900	800	600	600	800	500	800	1200	1100	800	500	4900	17700	15300	20000+	12100	1500	1700	1500	1100	1000	1000	1300
20	1700	1000	900	800	600	800	600	800	1300	800	900	600	4600	17900	12600	19300	10800	1500	1700	1400	1000	1000	1100	1200
24	1600	1000	1000	800	800	800	600	800	1300	800	800	600	4300	14800	13400	18500	7200	1300	1600	1200	1000	1000	1000	1400
28	1600	1000	900	800	800	800	700	1000	1700	1600	1000	800	4200	10300	8100	11400	3800	1200	3500	1700	1300	1000	1600	1100
32	1500	1100	1000	1100	800	800	600	900	1800	1400	1000	700	1900	7000	6200	7900	4900	1000	1500	1300	1300	900	1300	1200
36	1300	1100	1100	1000	900	1000	1000	1000	1500	1700	1100	600	3000	2000	6000	9100	1900	900	2000	2300	850	850	1450	1300
40	1300	1050	1000	850	850	900	650	850	950	900	1000	600	2750	2400	6500	9700	5500	1150	1600	1550	1600	1350	1350	1050
44	1200	1100	1000	1150	850	850	650	800	1400	1200	1050	800	1850	2500	4200	4850	2100	1500	2150	1350	1150	950	1400	350
48	1200	1200	1200	1000	1100	1050	700	1000	1000	1100	1100	800	2000	2550	4150	4700	3150	1500	1250	1100	1500	1100	1450	400
52	1350	1200	1200	1250	1150	1050	750	1050	1150	900	1050	650	1250	2700	4450	5250	1700	1300	2550	1750	1200	1050	1550	800
56	1300	1300	1200	1100	1200	1100	850	1100	1250	1050	1200	900	1150	900	3150	5000	2400	1250	2300	1650	1050	1000	1400	650
60	1250	1300	1250	1150	1150	1150	750	1000	1100	1700	1200	700	950	1100	2350	3650	2350	1250	1300	1200	1150	1150	1450	800
68	1300	1350	1400	1150	1050	1100	850	1000	1100	1050	1150	750	1150	950	2000	4550	2500	1500	1850	1650	1200	1100	1450	850
156	950	950	1000	900	950	900	800	950	850	850	900	750	950	800	850	1150	1800	900	1100	1000	1000	950	900	700
216	600	600	600	600	600	650	550	600	600	500	600	450	500	500	550	550	850	600	500	500	550	600	500	550
306	300	300	300	300	300	300	250	300	250	250	300	200	250	250	250	300	400	300	250	250	300	300	250	300
396	200	200	200	200	200	200	150	200	150	150	150	150	150	150	150	150	200	200	150	150	200	150	150	200

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-17. FUEL VAPOR CONCENTRATIONS IN PPM

Test 17 Conditions: Fuel - JP-4. Temperature - 50°F. R.H. - 74%. Sample Configuration No. 3. Four gallons of JP-4 in a spill at the center of the east wall. 12/3/71.

Time (min)*	Sample Point Numbers																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4500	3500	400	0	600	900	0	0	0	0
4	200	0	100	0	100	0	0	0	100	100	100	0	3100	8300	4000	8600	1900	600	900	500	400	300	300	200
8	600	400	400	200	100	100	300	300	600	1000	600	400	2600	6000	5800	10200	3400	900	2100	900	1400	700	600	300
12	1000	700	700	400	400	400	400	500	800	600	1200	700	2300	1000	6600	8300	5000	1200	1300	1200	1100	1000	800	300
16	1200	1000	900	800	900	700	600	900	900	800	1300	800	2100	1100	2500	7100	2600	1100	1500	1600	1000	900	1000	300
20	1100	1100	1100	900	1000	800	700	800	900	800	800	800	800	700	1700	2400	3000	1200	2100	1800	1200	1100	1800	200
24	1300	1600	1600	1000	1000	900	900	1000	900	900	1000	900	1100	900	1600	2400	2400	1200	1400	1300	1100	1100	1600	100
28	1300	1500	1500	1100	1100	1100	1000	1200	1100	1100	1200	1000	1300	1100	1500	1700	2300	1300	1400	1400	1300	1300	1400	100
32	1200	1400	1500	1350	1300	1250	1150	1300	1250	1200	1300	1150	1400	1150	1450	1600	2350	1550	1450	1400	1350	1400	1450	150
36	1350	1450	1450	1400	1350	1350	1250	1350	1350	1150	1350	1150	1400	1150	1700	1400	1850	1400	1300	1350	1400	1450	1400	150
40	1250	1350	1350	1350	1400	1300	1200	1350	1300	1250	1300	1150	1350	1100	1350	1500	1850	1350	1250	1250	1400	1300	1300	150
44	1250	1350	1350	1350	1300	1300	1100	1300	1250	1200	1300	1150	1350	1150	1350	1350	1950	1400	1350	1300	1450	1500	1400	150
90	1150	1200	1200	1200	1250	1200	1100	1200	1150	1100	1150	1000	1050	950	1150	1150	1600	1400	1150	1200	1200	1200	1200	100
120	1050	1100	1100	1100	1100	1100	1050	1100	1050	1050	1100	1000	1100	950	1000	1000	1500	1150	1050	1000	1150	1200	1050	100
150	850	900	900	950	950	900	850	950	950	900	950	800	950	800	900	850	1000	1000	850	850	900	950	850	100
180	725	780	790	780	815	800	755	845	820	800	830	735	815	665	725	740	925	895	740	745	840	870	775	120
186	705	760	770	775	790	780	710	780	770	715	775	665	730	580	655	680	790	730	690	695	730	775	705	105

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec. Sample Point No. 20 is 200 sec).

TABLE IV-18 FUEL VAPOR CONCENTRATIONS IN PPM

Test 18 Conditions: Fuel - JP-4. Temperature - 64°F. R.H. - 75%. Sample Configuration No. 3. Ten gallons of JP-4 in a large spill at the center of the east wall. 12/7/71.

Time	Sample Point Numbers																						
(min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	3100	200	200	100	100	0	0	0
4	0	0	0	0	0	0	0	0	0	300	100	100	4700	17600	15100	20000+	8600	900	1400	600	700	500	700	900
8	1200	400	300	300	200	200	100	200	1000	600	400	400	700	20000+	17600	20000+	13400	1800	1700	800	800	700	700	1100
12	1600	600	400	400	300	300	300	400	1400	1100	700	300	9900	17700	18100	20000+	18800	2800	1300	700	1800	800	800	1100
16	1600	700	600	500	400	400	300	400	1300	800	600	500	9700	18900	18500	20000+	17200	2300	2000	1100	1400	1100	800	1100
20	1700	700	600	500	400	400	500	400	1500	900	600	500	7600	20000+	17900	20000+	13600	2000	2200	1000	1500	1300	900	1200
24	1700	700	600	700	500	400	400	500	1400	700	700	600	6800	15600	17300	20000+	16800	2300	1100	1000	1300	900	900	1000
28	1600	800	700	600	600	500	500	600	1600	1100	800	700	9200	18200	16100	20000+	14300	2700	1300	1000	1600	1000	1000	1100
32	1700	800	700	700	600	600	600	700	1900	1600	1100	800	7400	16600	17400	20000+	15600	3900	1700	1100	2800	1300	1000	1100
36	1800	800	700	600	700	700	600	700	1500	800	800	700	5700	15800	14000	20000-	13400	2300	1300	1100	2000	1500	900	1000
40	1600	800	700	800	700	700	600	700	1400	900	1000	700	8000	15300	12800	19100	13200	2800	1300	1100	1700	1100	1000	1000
44	1700	900	800	800	700	700	700	800	1500	900	900	800	6600	13300	14300	18100	14500	2700	1200	1000	2100	2000	1200	1000
48	1700	900	800	900	800	800	700	800	1600	1500	1000	900	7900	14500	15200	19200	12500	2900	1400	1200	2300	2800	1300	1000
52	1800	1100	1000	1100	1000	900	800	1200	1700	1100	1500	1000	6000	13800	11400	16400	11200	2000	1400	1300	1700	1400	1300	900
56	1800	1200	1000	1400	1300	1300	1100	1200	1700	1100	1200	1100	5200	12200	12400	14900	12600	3000	1700	1400	2500	2200	1300	900
60	1700	1100	1000	1800	1600	1200	1100	1200	1700	1200	1300	1200	4600	11000	10700	14700	8400	2200	1600	1500	1700	2100	1500	900
64	1700	1100	1000	1500	1500	1700	1200	1500	1800	1300	1300	1200	2800	9000	8700	13000	5600	2000	1600	1400	1800	1600	1500	800
68	1500	1000	1000	1300	1500	1300	1100	1300	1700	1300	1300	1200	4700	9400	9600	12000	9100	2000	1900	1600	1700	2100	1500	800
72	1500	1100	1000	1300	1400	1400	1200	1600	1700	1400	1400	1300	3800	7500	8900	12500	6400	1700	2200	1800	1800	1900	1600	800
76	1700	1400	1200	1500	1700	1600	1300	1600	1800	1600	1500	1400	4100	9700	7500	11100	8700	2000	2200	1700	1900	1900	1700	800
80	1700	1400	1300	1600	1600	1600	1400	1400	1800	1500	1700	1500	3100	5700	8600	10900	7100	2000	1900	1800	2000	2200	1800	800
84	1800	1600	1500	1600	1600	1600	1500	1600	1800	1600	1600	1600	3500	6600	8500	8700	6100	2000	2400	1800	1900	1900	1800	700
88	1800	1700	1600	1700	1700	1700	1700	1700	1900	1700	1600	1700	3100	5400	5500	7200	5300	2100	2600	2200	1800	1800	1800	600
92	1700	1600	1600	1600	1500	1600	1700	1700	2000	1800	1700	1700	2500	5600	7400	8700	4800	2100	2400	1800	1900	1900	1800	700
96	1800	1700	1700	1700	1600	1600	1600	1700	1900	1700	1800	1700	2800	4400	5400	8000	4600	2700	2300	1900	2100	1900	1800	600
136	1700	1500	1500	1700	1700	1700	1700	1700	1900	1800	1800	1700	2400	3800	5400	6900	3900	2000	2300	1900	1900	2100	2000	600
176	1350	1300	1250	1550	1700	1600	1500	1550	1700	1600	1650	1550	2550	3250	5100	6050	4150	1800	2100	1850	1750	1900	1750	550
216	1250	1150	1100	1350	1400	1450	1400	1400	1500	1400	1350	1350	2000	2250	3300	4400	3150	1600	1550	1450	1700	1550	1600	450
256	900	850	800	1200	1150	1200	1150	1150	1250	1250	1150	1100	1450	2200	3250	3500	3800	1450	1350	1250	1200	1300	1400	400
296	900	850	800	1000	950	1050	1050	1000	1100	1100	1000	1000	1300	1600	2550	2800	3000	1200	1150	1100	1200	1100	1150	650
336	800	750	750	950	850	800	900	900	950	1000	850	900	1100	1700	2200	3100	2600	1300	1100	1050	1200	1100	725	330

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV 19. FUEL CONCENTRATIONS IN PPM

Test 19 Conditions: Fuel - avgas. Temperature - 67°F R.H - 90%. Sample Configuration No. 3. Four gallons of avgas in spill at the center of the east wall. 12/8/71.

Time	Sample Point Numbers																						
(min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	1200	16600	8700	20000+	10600	700	600	400	400	300	400	800
4	1000	200	100	100	100	100	100	300	800	200	400	200	14900	20000+	20000+	20000+	20000+	1700	1300	900	800	700	900	1800
8	2200	600	400	300	400	600	300	200	2100	500	300	400	20000+	20000+	20000+	20000+	20000+	2200	2200	1000	1000	900	1000	2000
12	2600	700	500	400	600	300	300	300	2500	1100	600	800	20000+	20000+	20000+	20000+	20000+	2800	3200	1100	1200	1200	1100	2100
16	2800	800	600	400	400	300	300	300	2800	1600	1000	1300	20000+	20000+	20000+	20000+	20000+	3500	3700	1200	1200	1000	1200	2100
20	2800	800	600	400	400	500	400	400	2700	2000	1300	1900	20000+	20000+	20000+	20000+	20000+	3900	4300	1300	1300	1000	1200	2200
24	2900	1000	700	600	400	400	400	400	3000	2600	1700	2300	20000+	20000+	20000+	20000+	20000+	4300	5000	1400	1400	1100	1300	2200
28	2900	1000	800	600	500	400	500	500	3200	3700	2400	4000	20000+	20000+	20000+	20000+	20000+	5700	6800	1800	2000	1200	1300	2200
32	2900	1000	800	600	500	500	600	700	3300	4100	3300	4600	20000+	20000+	20000+	20000+	20000+	6400	8000	1800	2100	1200	1300	2100
36	2800	1000	800	600	500	600	700	1000	3600	4900	4000	5000	20000+	20000+	20000+	20000+	20000+	7000	8300	2200	2700	1200	1200	2000
40	2800	1000	800	600	600	500	900	1400	4000	6000	5000	6100	20000+	20000+	20000+	20000+	20000+	8000	8100	2800	2400	1200	1200	2000
44	2700	1000	800	700	600	600	1300	1600	4400	6300	5400	6300	20000+	20000+	20000+	20000+	20000+	8100	8900	3000	3100	1200	1200	2000
48	2800	1000	800	600	600	600	2500	2500	5100	7000	6500	7800	20000+	20000+	20000+	20000+	20000+	9000	9600	4000	3600	1200	1200	1900
52	2700	1000	800	600	600	500	3000	2700	5600	7400	7300	7900	20000+	20000+	20000+	20000+	20000+	9500	9500	4700	4500	1200	1200	1900
56	2700	1000	800	700	600	600	3500	3500	6000	8000	7900	8000	20000+	20000+	20000+	20000+	20000+	9800	9100	5100	4900	1200	1200	1800
60	2600	1000	800	600	600	600	3500	4000	6400	7900	7000	8000	20000+	20000+	20000+	20000+	20000+	9800	9600	5100	4800	1200	1200	1900
64	2600	1000	800	700	600	600	3700	3600	6300	7800	7900	8200	20000+	20000+	20000+	20000+	20000+	9700	9600	5600	5700	1300	1200	1800
68	2600	1000	800	700	600	600	4200	4100	6700	8200	8000	8600	20000+	20000+	20000+	20000+	20000+	10100	9300	5900	5600	1200	1200	1700
72	2500	1000	800	700	600	600	4200	5200	7000	8600	8100	8500	20000+	20000+	20000+	20000+	20000+	10000	9700	5300	5500	1300	1100	1700
76	2400	900	700	700	600	600	4000	4200	6400	8200	7300	7800	20000+	20000+	20000+	20000+	20000+	9400	9600	5600	5300	1200	1200	1700
80	2400	900	700	700	600	600	4000	4400	6500	8100	7700	8200	20000+	20000+	20000+	20000+	20000+	9800	8900	5200	5700	1300	1200	1700
84	2300	900	700	600	700	600	4200	4600	6700	8200	7700	8000	19500	20000+	20000+	20000+	20000+	9100	9400	5800	6200	1300	1100	1600
88	2300	900	700	600	600	600	4000	4500	6600	8000	7400	7600	19300	20000+	20000+	20000+	20000+	9300	9200	6000	5900	1300	1100	1600
92	2200	900	700	600	600	600	3900	4100	6300	7700	7400	7500	19400	20000+	20000+	20000+	20000+	9000	9300	5300	4400	1200	1100	1500
96	2200	900	700	600	600	600	3900	4300	6500	7800	7300	7400	18600	20000+	20000+	20000+	20000+	8900	8800	5800	5600	1300	1100	1600
100	2200	900	700	600	600	600	4100	4800	6600	7900	7500	7600	17800	20000+	20000+	20000+	20000+	9100	8900	5900	5900	1300	1100	1500
104	2200	900	700	700	600	600	4500	5100	6700	7800	7800	7600	17100	20000+	20000+	20000+	20000+	9000	8100	6100	6600	1300	1000	1400
108	2100	900	800	700	600	600	4600	5600	7000	7500	7300	6900	15400	20000+	20000+	20000+	20000+	8500	8000	5800	6600	1300	1100	1500
112	2200	1000	800	700	600	600	4600	5700	7000	7300	7200	6700	15700	20000+	20000+	20000+	20000+	8500	7700	5900	6700	1300	1100	1400
116	2100	900	800	700	600	600	4600	5800	6900	7500	7000	6800	14500	20000+	20000+	20000+	20000+	8400	7700	6200	6300	1200	1100	1400
120	2100	900	700	700	700	700	4400	5400	6700	7200	6800	6400	13400	20000+	20000+	20000+	20000+	8000	6900	5500	6900	1300	1000	1300
124	2000	900	700	700	600	600	4600	5600	6600	6700	6700	6100	12300	20000+	19500	20000+	19300	7900	6500	5300	6500	1200	1000	1200
128	1900	800	700	700	600	600	4400	5200	6500	6700	6300	6200	7200	19300	18300	20000+	15700	7400	6300	5500	6500	1200	1000	1200
132	1800	800	700	700	700	600	4300	5200	6400	6600	6200	6100	11600	18600	18000	20000+	16000	7300	6500	5400	5800	1200	1000	1200
136	1800	800	700	700	600	600	4100	5200	6200	6600	6100	5900	11200	18100	17600	20000+	14600	7200	5700	5000	6000	1300	1000	1100
140	1800	800	700	700	600	600	4200	5100	6000	6100	6000	5400	11500	17100	16800	19800	16700	6900	5500	4600	6000	1300	1000	1100
144	1800	900	700	700	700	700	4000	4700	5700	5700	5700	5400	9800	15900	16200	18600	13400	6600	5300	4800	5700	1200	1000	1000
148	1700	900	800	700	800	700	4000	5100	5600	5700	5500	5000	10000	15900	15700	18400	15000	6600	5400	4600	5800	1300	1000	1000
196	2000	1700	1600	2300	2000	1900	2000	2500	3000	2700	2600	2200	4300	8400	7700	10000	6800	3100	2500	2500	3000	2700	2600	800
244	1800	1600	1600	1600	1400	1500	1700	1600	2000	1800	1700	1600	2800	6100	5700	7500	4800	2000	1800	1700	1900	1900	1500	600
292	1200	1200	1100	1300	1100	1000	1200	1200	1400	1200	1200	1200	1800	4100	4400	6000	4500	1500	1300	1300	1400	1300	1200	400

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec).

TABLE IV-20. FUEL CONCENTRATIONS IN PPM

Test 20 Conditions: Fuel - JP-4. Temperature - 67°F. R.H. - 100%. Sample Configuration No. 3. Four gallons of JP-4 in spill at the center of the east wall. 12/9/71.

Time	Sample Point Numbers																						
(min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	100	800	800	3400	700	200	100	0	0	0	0	100
4	200	0	0	0	0	0	0	0	100	100	300	0	5100	16500	13200	20000+	12400	700	600	400	300	300	300	900
8	900	200	100	100	100	0	0	0	800	400	300	300	11300	20000+	18400	20000+	16800	1100	1300	600	500	400	400	900
12	1200	300	200	200	200	100	100	100	1200	800	400	700	12300	20000+	20000+	20000+	18500	1600	2200	800	700	400	500	1000
16	1300	400	300	200	200	200	100	200	1400	1300	700	1200	14200	20000+	20000+	20000+	20000+	2600	2700	1100	700	500	600	1100
20	1500	500	300	200	200	200	200	200	1600	1900	1600	1900	14800	20000+	20000+	20000+	20000+	2800	3600	1400	1000	600	600	1100
24	1500	500	400	300	300	200	300	300	1900	2400	1800	2500	14600	20000+	20000+	20000+	20000+	3600	4200	1700	1200	600	600	1100
28	1500	500	400	300	300	200	400	400	2000	2800	2200	2800	15700	20000+	20000+	20000+	20000+	3900	4600	1800	1400	600	600	1200
32	1600	500	400	300	300	200	400	600	2200	3000	2400	3400	15900	20000+	20000+	20000+	20000+	4300	5200	1900	1500	600	600	1100
36	1500	600	400	300	300	300	600	700	2300	3500	2700	3700	15700	20000+	20000+	20000+	20000+	4700	5700	2200	1800	700	700	1200
40	1600	600	400	300	300	300	800	800	2500	3800	3200	4000	16000	20000+	20000+	20000+	20000+	5100	6200	2600	1900	700	700	1100
44	1600	600	400	300	300	300	1300	1100	2800	4300	3500	4600	15300	20000+	20000+	20000+	20000+	5600	6800	2900	2100	700	700	1100
48	1600	600	400	300	300	300	1400	1500	3100	4700	3900	5000	15100	20000+	20000+	20000+	20000+	6000	6800	3400	2500	700	700	1100
52	1600	600	400	400	300	300	1700	1700	3400	4900	4300	5200	15500	20000+	20000+	20000+	20000+	6400	7100	3500	2700	700	700	1100
56	1600	600	400	400	400	300	1900	1900	3500	5200	4400	5600	15200	20000+	20000+	20000+	20000+	6400	7300	3700	3000	700	700	1100
60	1600	600	500	400	400	300	2100	2300	3900	5400	4800	5700	14700	20000+	20000+	20000+	20000+	6400	7500	4100	3200	800	700	1100
64	1600	600	400	400	400	300	2500	2600	4400	5700	5000	5600	14200	19900	20000+	20000+	19000	6600	7500	4400	3700	800	700	1100
68	1600	600	500	400	400	300	2600	2900	4300	5700	5300	5800	14400	19800	19800	20000+	19100	6800	7700	4500	3900	800	700	1100
72	1600	600	500	400	400	300	2900	3100	4700	5900	5300	6000	14400	19200	19300	20000+	19400	7200	7700	4800	4100	800	700	1100
76	1600	600	500	400	400	300	3000	3200	4900	6000	5500	5900	14000	18800	19300	20000+	18600	7190	7800	4800	4200	800	700	1100
80	1600	600	500	400	400	300	3100	3300	4900	6000	5500	5900	13800	18700	19000	20000+	18600	7100	7800	5100	4300	800	700	1100
84	1600	600	500	400	400	400	3200	3400	5000	6200	5500	6000	14000	18400	18500	20000+	18400	7400	7800	5100	4600	800	700	1000
88	1600	600	500	400	400	400	3400	3500	5200	6300	5700	6000	13900	18200	18500	20000+	17600	6900	8000	5400	4800	800	800	1000
92	1600	700	500	400	400	400	3500	3800	5400	6200	5500	6000	13100	17500	17400	20000+	17100	7000	7500	5400	5000	900	800	1000
96	1600	600	500	400	400	400	3600	4000	5400	6200	5600	6100	12600	17100	17300	19700	16900	7000	7500	5600	5000	900	700	1000
100	1500	700	500	400	400	400	3700	3900	5400	6300	5800	6000	12500	16800	17300	19000	16800	6600	7300	5700	5000	900	800	1000
104	1500	700	500	400	400	400	3700	4000	5400	5900	5600	5900	11900	16400	16800	18600	16400	6900	7200	5400	5100	900	800	1000
108	1500	600	500	400	400	400	3700	3900	5300	5900	5400	5900	11700	16100	16100	18300	15500	6900	7200	5300	5200	900	800	1000
112	1500	600	500	400	400	400	3700	4000	5300	6000	5500	5900	11700	15800	15100	18100	16000	6800	7000	5100	5200	900	800	1000
116	1500	700	500	400	400	400	3700	4000	5400	6100	5400	5800	11600	15500	15900	18000	15600	6900	7300	5000	5200	900	900	1000
164	1500	800	600	600	500	500	3500	4000	5200	6300	5700	6100	11500	14500	15200	16500	14800	7300	7500	5200	5100	1000	1000	900
212	1600	800	700	600	600	600	4000	4200	5500	6500	5800	6300	10400	13000	13600	14700	13500	7300	7600	5800	5400	1100	1100	900
260	1600	800	700	700	700	600	3700	4100	5300	6300	5700	5900	9800	12000	12800	13700	12900	7100	7400	5500	5300	1100	1100	800
308	1500	800	700	700	700	700	3300	3900	4800	5600	5100	5200	8500	10600	11300	12100	11400	6300	6400	5000	5000	1100	1100	800
356	1600	900	800	700	800	700	2900	3700	4700	5600	5100	5200	8500	10400	11200	11800	11300	6500	6600	5000	4800	1100	1200	800
404	1500	900	800	700	700	700	2700	3200	4200	5000	4600	4600	7500	9400	10100	10800	10300	5700	5900	4500	4200	1000	1000	700
452	1300	800	800	700	700	700	2400	2600	3600	4500	4000	4200	7100	8800	9600	10000	9600	5200	5400	3700	3400	1000	900	700
500	1400	900	800	800	800	700	2100	2200	3300	4300	3800	4000	7000	8800	9500	10000	9600	4700	5100	3300	2800	1000	900	700
548	600	500	400	500	500	500	600	600	700	700	700	800	900	1400	2100	2500	1700	800	800	700	600	500	500	200
588	400	400	400	400	400	400	400	300	400	400	400	400	400	500	700	1000	700	400	600	600	400	400	400	200

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-21. FUEL CONCENTRATIONS IN PPM

Test 21 Conditions: Fuel - JP-4 Temperature - 65°F. R. H. - 75% Sample Configuration No. 3. Four gallons of JP-4 in spill at the center of the east wall. 12/14/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	100	100	100	200	3900	5100	13100	1500	700	400	400	500	300	400	600
4	800	300	300	200	100	200	200	400	600	500	500	200	11300	20000+	20000+	20000+	20000+	2000	1400	1300	1000	800	900	1500
8	2000	700	600	400	300	400	400	500	1900	1500	1000	600	19200	20000+	20000+	20000+	20000+	2300	2200	1900	1200	1000	1100	1900
12	2700	900	700	600	500	500	500	700	3200	2900	1800	1200	20000+	20000+	20000+	20000+	20000+	2600	4800	2400	1500	1200	1300	2000
16	2900	1100	900	700	600	600	700	800	3500	3500	2100	1800	20000+	20000+	20000+	20000+	20000+	3400	5700	2900	1500	1400	1400	2100
20	3100	1200	1000	800	700	900	800	1000	4200	4500	3000	3000	20000+	20000+	20000+	20000+	20000+	4100	6500	2900	1600	1400	1600	2100
24	3200	1400	1200	900	800	900	800	1000	4300	5400	3800	4300	20000+	20000+	20000+	20000+	20000+	4600	7200	4100	1900	1500	1600	2100
28	3200	1400	1300	1000	900	1100	900	1200	4900	5900	3900	4900	20000+	20000+	20000+	20000+	20000+	5400	8200	4300	2000	1600	1700	2100
32	3400	1600	1400	1100	1000	1000	1000	1500	4800	6700	4700	5900	20000+	20000+	20000+	20000+	20000+	5400	9200	4400	2200	1600	1800	2100
36	3500	1600	1400	1200	1000	1100	1100	1800	4700	7200	5200	6000	20000+	20000+	20000+	20000+	20000+	6100	10500	4500	2300	1700	1800	2000
40	3300	1700	1500	1300	1100	1200	1200	2100	5500	7700	5600	6700	20000+	20000+	20000+	20000+	20000+	7200	11100	4900	2300	1900	1900	2100
44	3400	1800	1600	1300	1200	1200	1400	2000	5800	8100	6200	5700	20000+	20000+	20000+	20000+	20000+	7400	11300	4900	2400	1900	2000	2000
48	3400	1800	1700	1400	1300	1400	1600	2400	6000	8700	6500	8100	20000+	20000+	20000+	20000+	20000+	8000	11700	5500	2400	1900	2100	2000
52	3400	1900	1700	1500	1400	1400	2000	2600	6500	8900	7300	7400	20000+	20000+	20000+	20000+	20000+	8300	12000	5800	3100	2100	2100	2000
56	3400	2000	1800	1600	1400	1500	2400	3100	6900	9600	8000	9900	20000+	20000+	20000+	20000+	20000+	9500	11800	6200	3200	2100	2100	1900
60	3400	2000	1800	1600	1500	1600	2300	3200	6700	9600	7800	7900	20000+	20000+	20000+	20000+	20000+	8900	12100	6000	3000	2200	2200	1900
64	3500	2100	1900	1700	1600	1600	2200	3200	6900	9800	7700	8300	20000+	20000+	20000+	20000+	20000+	9400	12400	6300	3400	2200	2300	1900
68	3500	2200	2000	1800	1600	1600	2500	3300	7000	9800	8000	9400	20000+	20000+	20000+	20000+	20000+	9400	13200	6100	3400	2200	2300	1900
72	3600	2200	2100	1800	1700	1800	2400	3400	7400	9800	7800	9000	20000+	20000+	20000+	20000+	20000+	10200	12100	6600	3600	2400	2400	1900
76	3600	2300	2100	1900	1800	1800	2300	3700	7400	10200	8400	10000	20000+	20000+	20000+	20000+	20000+	9700	12500	6500	3700	2400	2500	1900
80	3600	2300	2200	2000	1800	1900	3400	3500	7200	9900	8100	9600	20000+	20000+	20000+	20000+	20000+	10100	13000	6700	3800	2500	2500	1900
84	3800	2400	2300	2000	1900	1900	2800	3600	7400	10100	7700	9800	20000+	20000+	20000+	20000+	20000+	9800	12600	6600	3900	2500	2500	1900
88	3800	2500	2400	2100	1900	2000	2800	3600	7300	10100	8000	9400	20000+	20000+	20000+	20000+	20000+	9900	12600	6600	4000	2600	2600	1900
92	3800	2500	2400	2200	2000	2000	2600	3600	7200	9900	8000	9200	20000+	20000+	20000+	20000+	20000+	9600	12700	6600	3700	2600	2600	1800
96	3800	2600	2400	2200	2000	2100	2800	3700	7300	10100	8300	9300	20000+	20000+	20000+	20000+	20000+	9400	12700	6600	4000	2600	2700	1800
100	3900	2600	2500	2200	2100	2100	2700	3500	7300	9600	7700	9400	20000+	20000+	20000+	20000+	20000+	9400	12500	6500	4000	2700	2700	1800
104	3900	2600	2500	2300	2100	2200	2500	3400	7200	9700	7700	8900	20000+	20000+	20000+	20000+	20000+	8800	12300	6300	3900	2800	2800	1800
108	3900	2700	2500	2300	2200	2300	2700	3600	7000	9800	7700	9400	20000+	20000+	20000+	20000+	20000+	8800	12100	6300	3600	2800	2800	1800
112	3900	2800	2600	2400	2300	2500	2800	3400	7000	9600	7700	9300	20000+	20000	20000+	20000+	20000+	8800	12500	6200	3700	2900	2900	1800
116	3900	2800	2600	2400	2300	2400	2600	3200	6800	9500	7500	8890	20000+	20000+	20000+	20000+	20000+	8400	12200	6400	3600	2900	2900	1800
120	4000	2800	2700	2500	2400	2400	2600	3400	6900	9400	7500	9100	20000+	20000+	20000+	20000+	20000+	8400	11900	6300	3700	2900	3000	1700
124	4000	2900	2700	2600	2400	2500	2700	3300	6700	9200	7100	9000	20000+	20000+	20000+	20000+	20000+	8500	12100	6300	3600	3000	3000	1700
128	4000	2900	2800	2600	2500	2600	2700	3600	6600	9200	7400	8700	20000+	20000+	20000+	20000+	20000+	8300	12100	6500	3800	3000	3200	1700
132	4100	3000	2800	2700	2600	2900	2800	3300	6800	9000	6900	9000	20000+	20000+	20000+	20000+	20000+	9100	11800	6500	4100	3100	3000	1700
136	4000	3000	2900	2700	2600	2800	2900	3400	6800	8500	6300	8500	20000+	20000+	20000+	20000+	20000+	5200	11600	6600	4700	3200	3100	1700
140	4100	3000	2900	2700	2700	2900	2900	3000	6800	8600	6600	8600	20000+	20000+	20000+	20000+	20000+	9300	11500	6300	4000	3200	3100	1700
144	4000	3000	2900	2700	2800	2900	2800	3600	6600	8800	7000	6900	20000+	20000+	20000+	20000+	20000+	8600	11100	6200	4100	3200	3100	1700
148	4100	3100	3000	2800	2800	3000	2800	3400	6500	8900	7000	8200	20000+	20000+	20000+	20000+	20000+	8600	11300	6800	4300	3200	3200	1600
152	4100	3100	3000	2800	2800	2900	2900	3700	7000	8200	6400	8200	19300	20000+	20000+	20000+	20000+	9100	11100	6900	4600	3200	3300	1600
156	4100	3100	3000	2900	2800	2800	2800	3600	6200	8300	6900	8100	19300	20000+	20000+	20000+	20000+	8200	11100	6700	4200	3300	3300	1600
160	4100	3100	3000	2900	2900	2900	2800	3500	6300	8300	6500	7700	19300	20000+	20000+	20000+	20000+	8100	10800	6200	3900	3300	3300	1600
164	4100	3200	3100	2900	2900	2900	2800	3500	5900	8100	6600	7700	19300	20000+	20000+	20000+	20000+	7200	10700	6100	3800	3400	3300	1600
168	4100	3200	3100	3000	3000	3000	2900	3300	5500	7900	6200	7700	19000	20000+	20000+	20000+	20000+	7600	10700	6300	3800	3400	3300	1600
172	4100	3200	3100	3000	3000	3100	2900	3500	5400	7900	6500	6100	18600	20000+	20000+	20000+	20000+	7100	10700	5900	3800	3400	3400	1600
176	4200	3300	3200	3100	3000	3000	3000	3600	5300	7700	6100	7500	18600	20000+	20000+	20000+	20000+	6700	10300	5700	3800	3600	3400	1500
180	4200	3300	3200	3100	3100	3200	3000	3400	5000	7300	5800	6600	18500	20000+	20000+	20000+	20000+	6800	10200	5800	3800	3600	3500	1600
184	4300	3400	3300	3200	3200	3200	3100	3500	4900	7300	5800	6300	18400	20000+	20000+	20000+	20000+	6800	10000	5800	3900	3600	3500	1600
188	4300	3400	3300	3200	3200	3300	3100	3500	4800	7200	5700	6400	18000	20000+	20000+	20000+	20000+	6700	10000	5500	3900	3600	3500	1500
192	4300	3500	3400	3300	3300	3300	3200	3500	4700	7100	5500	6000	17900	20000+	20000+	20000+	20000+	6600	9500	5300	4000	3800	3600	1500
196	4300	3600	3400	3400	3300	3400	3200	3600	4700	7000	5300	5700	17700	20000+	20000+	20000+	20000+	6400	9300	5600	4000	3800	3700	1500
200	4300	3600	3500	3400	3400	3400	3300	3600	4700	6700	5400	4900	17200	20000+	20000+	20000+	20000+	6200	9000	5600	4000	3800	3700	1500
204	4400	3700	3500	3400	3400	3500	3300	3500	4600	6500	5100	4800	17400	20000+	20000+	20000+	20000+	5900	8300	5500	4000	3800	3700	1500
208	4400	3700	3600	3500	3500	3400	3300	3600	4500	6400	5100	4300	16800	20000+	20000+	20000+	20000+	6100	8300	5300	4000	3800	3700	1500
212	4400	3700	3600	3500	3500	3500	3400	3600	4700	6300	4700	5400	16300	20000+	20000+	20000+	20000+	6600	8300	5700	4600	3900	3800	1500
216	4400	3700	3600	3500	3500	3600	3400	3700	4800	6500	5400	5300	15900	20000+	20000+	20000+	20000+	6300	8900	5600	4300	3900	3800	1400
220	4400	3800	3600	3600	3500	3500	3400	3500	4900	6100	4900	4900	15600	20000+	20000+	20000+	20000+	6600	8400	5600	4300	3900	3800	1500
224	4400	3700	3600	3600	3500	3500	3400	3600	4800	6000	4900	4300	14500	20000+	20000+	20000+	20000+	6600	8400	5500	4300	3800	3800	1400
228	4300	3700	3700	3500	3500	3500	3400	3600	4600	6200	4700	4100	14800	20000+	20000+	20000+	20000+	5900	8000	5300	4200	3900	3800	1400
232	4400	3800	3700	3600	3600	3600	3500	3700	4600	6100	4800	3900	14300	20000+	20000+	20000+	20000+	5500	8000	5300	4100	3900	3800	1400
236	4400	3800	3700	3700	3600	3500	3500	3600	4600	5900	4700	3900	13900	19500	19800	20000+	20000+	5600	7600	5200	4200	3800	3800	1400
260	4400	3900	3800	3800	3800	3800	3700	3600	4400	4000	3800	3800	11900	16500	16800	19200	17100	5500	7600	5400	4100	3900	3800	1400
284	4400	4000	4000	4000	3900	3900	3900	3900	4400	4000	4000	4000	10400	14300	14400	16500	14300	5100	6100	4600	4200	4000	4000	1200
308	4300	4100	4000	4100	4000	4000	3900	3900	4400	4000	4000	4000	8700	12000	12200	14600	12500	4700	5500	4200	4600	4200	4200	1200
332	4200	4100	4000	4200	4000	4000	4000	3900	4300	4000	3900	4000	6700	9700	10200	11600	8000	5000	5000	4300	4600	4200	4200	1000
356	3900	3900	3900	3500	3200	3800	3800	3500	4000	3800	3400	3700	4800	6000	6900	8800	6000	4400	4700	4200	4300	4300	4300	1000
380	3400	3500	3500	3500	2900	3600	3600	3500	3500	3400	3300	3200	3100	3400	4100	6600	5000	4000	4800	4500	4000	4000	4000	800
404	2850	3000	2900	3050	2550	3000	3050	2850	3000	3050	2950	2950	2700	3050	3250	5800	4100	3500	4400	4100	3500	3100	3500	700
428	2850	3050	3000	3000	2650	3000	3000	3000	3000	3000	3000	2950	2900	3050	3150	4800	3150	3100	3800	3200	3050	2900	3150	600
452	2700	2950	2950	3000	2700	2950	3100	3000	3050	3050	3050	3000	2950	3100	3150	3300	3150	3050	3200	3150	3050	3100	3050	550
464	2700	2950	3000	3000	2850	3000	3050	3000	3000	3000	3000	3000	3000	3100	3100	3200	3150	3100	3200	3200	3050	3100	3100	500

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-22. FUEL CONCENTRATIONS IN PPM

Test 22 Conditions: Fuel - JP-4. Temperature - 77°F. R.H. - 65%. Sample Configuration No. 3. Four gallons JP-4 in spill at the center of the east wall. 12/14/71.

Time	Sample Point Numbers																							
(min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	4200	9100	3400	700	200	100	400	100	100	300
4	400	0	0	0	0	0	0	400	400	300	600	200	4200	19500	12800	20000+	12900	2900	700	400	600	600	500	900
8	1200	300	200	100	100	100	200	1100	1200	300	1000	500	8400	20000+	18000	20000+	16600	3000	800	500	800	900	500	1000
12	1300	400	300	200	200	200	200	1300	1900	1200	1800	800	10600	19500	19000	20000+	20000+	3400	1000	600	700	900	600	1000
16	1400	400	300	300	300	300	300	1900	2200	1700	2300	1000	9400	19600	17600	20000+	18000	3400	1400	700	800	900	600	1100
20	1500	500	400	400	300	300	300	600	2000	1700	1900	1300	10400	18700	18000	20000+	14600	3800	2100	700	800	700	600	1100
24	1500	600	400	400	700	400	400	1500	2300	2100	2800	2000	9700	17200	16700	20000+	14300	3700	2200	700	1700	700	600	1000
28	1500	600	400	600	600	500	400	1600	2200	2000	2500	1600	9900	16900	15400	19700	14700	3800	2000	700	1200	800	700	1000
32	1500	600	500	500	700	500	400	700	2000	1900	2300	1800	9800	16200	16200	18800	15200	3900	2200	700	1600	700	700	1000
36	1500	600	500	500	700	600	400	1300	2100	2100	2700	2300	9600	16200	15000	19500	13800	3400	2000	700	900	900	700	1000
40	1500	700	500	500	700	500	500	700	1900	1800	2100	1300	9200	15600	15200	18500	14600	3100	2200	800	900	800	700	1000
44	1500	700	600	600	700	500	500	800	1900	1800	2000	1400	8200	15300	14800	17500	13700	3300	2100	800	1300	800	700	900
48	1400	700	600	600	600	600	500	800	2100	2400	2400	2200	8700	13800	13600	15900	12000	4300	2300	800	1600	800	700	900
52	1400	700	600	600	700	600	500	1400	2100	2300	2600	1900	8000	13400	12800	15800	9400	4000	2400	800	2000	900	700	900
56	1400	700	600	600	700	600	600	1200	2400	2400	2600	2300	7700	12600	21800	14400	11000	4300	2200	800	1800	900	700	800
60	1400	700	600	600	600	600	600	1300	2300	2600	2900	2400	6300	12300	11600	14400	11400	3600	2500	800	1700	900	700	800
68	1400	600	500	500	500	450	500	1500	2000	2300	2450	1950	5550	10600	10400	13200	10700	3800	2100	700	2000	700	600	600
72	1100	500	400	500	500	500	700	1900	2300	2500	2600	2400	6000	10200	10300	12200	10500	3700	2000	900	1500	800	700	700
76	1200	600	500	600	600	600	700	1900	2300	2600	2800	2100	4700	9600	9900	11500	10100	3800	2200	1000	2200	900	700	700
80	1200	700	600	600	700	600	700	1800	2200	2500	2800	2200	5800	9200	9800	11400	9600	3900	2200	800	1900	900	700	700
84	1200	700	600	600	600	700	700	1700	2300	2600	2800	2200	5500	9500	10000	11700	9100	3700	2500	900	1900	1000	800	700
88	1200	700	600	700	700	700	700	1600	2100	2500	2400	1800	4500	9200	9400	11500	9700	3700	2100	900	1600	1000	800	700
92	1200	700	600	700	700	700	700	1700	2300	2400	2500	1900	5300	8700	9400	10600	9100	3700	2100	900	1900	1000	800	700
96	1200	700	600	700	700	700	700	1600	2200	2200	2600	2200	4900	8500	8800	10700	8500	3500	2300	1000	1900	900	800	700
100	1200	700	700	700	700	700	700	1700	2100	2200	2500	2000	5100	8500	8600	10500	8800	3700	2200	900	1800	1000	800	700
104	1200	700	700	700	700	700	700	1300	2000	2100	2400	2000	5000	8500	9100	10800	8100	3500	2200	1000	2500	900	800	700
108	1300	800	700	700	700	800	700	1400	1800	2100	2400	1700	5300	8600	9200	10800	8100	3400	2000	1000	1700	1000	900	700
112	1300	800	800	800	800	700	700	1500	1900	2000	2400	1800	5100	7900	8900	9900	8700	3300	2100	900	1700	1000	800	700
116	1300	800	800	800	800	700	700	1200	1700	1900	2100	1500	5500	8400	9000	10500	8900	2700	1800	1000	1200	1000	900	700
120	1300	800	800	800	800	700	700	900	1600	1700	1700	1300	5500	8400	9000	10500	8900	2700	1800	1000	1200	1000	900	700
124	1300	900	800	800	800	800	700	800	1600	1500	1400	1100	5700	8500	9100	10600	9000	2600	1900	1000	1200	1000	900	700
128	1300	900	800	800	800	800	700	800	1500	1500	1100	1000	5500	8600	9200	10800	9400	2400	1600	1100	1200	1000	900	700
160	600	500	500	500	400	400	400	400	600	600	400	300	700	1200	2400	4000	1600	500	600	400	400	500	500	300
192	600	400	400	300	300	300	300	300	700	800	400	300	600	1700	2500	3500	2300	500	600	400	300	400	400	300
224	500	400	400	300	300	300	300	300	500	600	400	400	700	900	2100	2900	1800	400	500	400	300	300	300	300
256	500	400	400	300	300	300	300	300	700	900	500	400	300	500	2000	2900	1500	400	500	400	400	400	400	300
288	500	400	400	400	300	300	400	300	600	800	500	300	300	500	1500	2500	1000	400	500	400	400	400	400	200
324	400	400	400	400	300	300	300	300	500	700	400	300	300	300	1000	1800	700	400	500	400	300	400	400	200

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-23 FUEL CONCENTRATIONS IN PPM

Test 23 Conditions: Fuel - JP-4 Temperature - 62°F R.H. - 65%. Sample Configuration No. 4. Four gallons of JP-4 in spill at the center of the east wall to coordinate Configuration No. 3 with No. 4. 12/16/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	100	3800	1900	900	700	600	300	200	200	300	500	400	500	300	400	300	300	300	400	500	500	3300	4300	12600
6	14900	8700	3200	1200	1000	800	600	500	400	400	400	400	400	400	400	500	500	700	1100	1000	700	5600	8300	14400
12	16000	11200	5100	2500	1100	1100	800	700	500	600	600	800	1000	1300	1700	1700	1200	1200	1400	1900	2300	6000	7900	1200
18	1400	13200	5200	3600	1900	1400	1100	1100	800	700	900	900	900	800	800	900	800	900	900	1100	2000	6500	8300	14400
24	15900	13300	5900	3000	1400	1200	1300	1200	900	900	900	900	900	900	1000	1000	900	1000	1000	1100	1700	5100	7900	14400
30	15300	10500	5600	3300	1700	1500	1600	1000	1000	1000	1000	1100	1100	1200	1000	1000	900	1000	1100	1200	1500	3800	6700	1300
36	15100	8400	4400	2300	1600	1200	1100	1000	1000	900	1000	1000	1000	1000	900	1000	1000	1000	1000	1200	1400	2200	4600	10700
42	12400	7100	3600	2200	1500	1200	1100	1000	1100	1100	1000	1100	1200	1100	1200	1000	1000	1000	1000	1100	1200	1900	2500	8400
48	10200	4500	2000	1300	1100	1000	1000	1100	1200	1200	1200	1200	1200	1200	1200	1200	1100	1000	1000	1000	1100	1600	2300	7600
54	8800	4000	1800	1200	1100	1000	1100	1000	1200	1100	1100	1100	1200	1200	1200	1300	1200	1100	1000	1000	1000	1100	1400	6400
60	7600	2800	1400	1100	1000	1000	900	1300	1300	1200	1100	1100	1100	1200	1200	1200	1100	1000	900	900	900	1300	1800	5800
66	7100	2600	1300	1000	1000	1000	1000	1100	1100	1100	1100	1000	1090	1100	1100	1200	1100	1000	800	800	800	1100	1300	4400
72	5800	2100	1200	1000	900	1000	1100	1200	1100	1100	1000	1000	1000	1000	1100	1100	1100	900	800	800	800	1006	1200	4700
78	5800	2300	1200	1000	900	800	800	1000	1100	1000	1000	1000	1000	1000	1000	1100	1000	900	800	860	900	1300	1800	5700
132	4400	1850	1000	750	650	600	600	700	750	700	700	700	700	750	800	850	800	650	600	600	650	800	1350	3250
186	4000	2050	1000	800	700	700	700	650	600	600	700	750	750	750	750	650	650	600	650	700	700	1150	1450	3600
240	3550	1800	1050	850	800	750	750	650	700	700	700	750	800	750	750	700	650	750	750	650	750	950	1200	3050
294	3250	1650	1000	800	750	700	700	600	650	650	650	700	700	750	700	750	700	750	650	600	550	700	1100	2400
348	2800	1500	900	750	700	700	750	750	750	750	700	700	700	700	700	750	750	750	700	700	700	750	1000	2350
402	2600	1400	750	750	750	800	800	750	750	750	700	750	750	750	750	700	700	700	750	700	700	700	900	2150
456	2050	1050	650	650	650	700	700	700	700	750	700	700	750	750	750	750	750	750	650	650	600	500	600	1900
510	1850	1100	750	700	750	750	750	700	700	700	750	750	750	750	700	750	750	750	750	700	700	650	700	1800
564	950	700	700	700	750	750	750	700	700	700	750	750	750	750	750	750	750	750	750	750	750	750	750	800
618	950	850	800	800	800	800	800	850	850	900	900	900	950	900	900	850	850	850	900	800	800	850	800	900
672	800	800	800	800	750	800	800	850	850	850	850	850	900	900	850	850	850	800	800	800	800	750	800	800
726	750	700	650	650	700	700	700	700	750	750	750	750	750	750	750	750	750	750	700	700	700	700	750	750
780	700	650	650	650	700	700	700	700	700	700	700	700	700	700	700	700	700	700	700	650	650	650	650	650
810	550	500	500	500	500	500	550	550	550	550	550	550	550	550	550	550	550	500	500	500	500	500	500	500

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec, Sample Point No. 20 is 200 sec).

TABLE IV-24. FUEL CONCENTRATIONS IN PPM

Test 24 Conditions: Temperature - 45°-66°F. R.H. - 31-93%. Preliminary Run at Hangar 935 at Kelly AFB; six F-100 aircraft. 12/18/71 to 12/20/71.

Time	Sample Point Numbers																						
(min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	5	0	0	0	0	0	5	0	0	5	0	0	10	0	0	0	0	0
84	25	25	20	25	25	35	35	35	30	40	40	30	25	25	20	20	25	25	25	20	20	20	20	20
132	20	20	25	25	25	25	25	25	15	20	15	15	15	20	20	20	30	25	30	15	10	10	10	10
204	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
708	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1524	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	1	2	2	3	2	2	1	0	1	3	2	1	0	0	0	0	0	0	0
2340	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2748	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2780	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec. Sample Point No. 20 is 300 sec).

TABLE IV-25 FUEL CONCENTRATIONS IN PPM

Test 25 Conditions: Temperature - 47°-78°F R H - 31-100% Run at Hangar 935 at Kelly AFB, eight F-100 aircraft. 12/22/71 to 12/27/71.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
504	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1008	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
1512	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2016	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
2520	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
3024	14	14	14	14	14	14	14	15	14	15	15	15	15	14	14	14	14	14	15	15	15	15	15	14
3504	15	15	15	15	15	15	15	15	15	15	16	16	16	15	15	15	15	15	15	15	15	15	16	15
3535	19	19	19	19	19	19	19	19	19	19	19	20	20	20	20	20	20	20	20	20	20	20	20	20
4039	18	19	19	18	18	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
4543	19	19	19	19	19	20	21	20	20	20	20	20	19	20	19	19	20	19	19	19	20	20	20	19
5047	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
5551	19	19	19	18	18	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
6055	25	25	25	26	25	26	26	25	25	25	25	25	25	25	25	24	24	24	24	25	25	25	25	25
6253	25	25	25	26	25	26	25	25	25	26	26	25	25	26	25	25	25	25	25	25	25	25	25	25
6295	5	5	5	5	5	5	5	5	5	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6559	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7087	6	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	6	6	6	6	6	5	5	5

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sample Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec).

TABLE IV-26 FUEL CONCENTRATIONS IN PPM

Test 26 Conditions: Temperature - 45°-69°F. R.H. - 37-93%. Run at Hangar No. 5 at Randolph Field with 23 T-38 aircraft. 12/30/71 to 1/2/72.

Time	Sample Point Numbers																							
(min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
57	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
144	2	2	2	2	2	3	2	3	3	4	4	5	2	4	2	2	2	3	2	3	3	3	3	3
150	4	5	5	5	5	6	6	7	7	7	7	8	12	8	9	8	9	9	8	9	9	9	11	12
156	10	10	10	10	10	10	10	10	11	10	10	11	14	11	13	11	11	11	11	11	11	11	10	14
216	19	19	20	20	20	20	20	20	20	20	20	21	23	23	22	21	20	21	20	20	20	20	20	23
224	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	9	9	9	9	9	9	9	9	12
378	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
432	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
720	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1296	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
1420	22	22	22	22	22	22	22	22	22	22	22	23	26	23	26	23	23	23	23	23	23	23	24	24
1894	9	9	9	9	9	9	9	9	9	9	9	10	10	11	10	9	9	9	9	9	9	9	9	9
2686	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2830	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3838	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3910	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4198	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 15 sec (e.g., Sa nple Point No. 2 is 30 sec, Sample Point No. 20 is 300 sec).

TABLE IV-27 FUEL CONCENTRATIONS IN PPM

Test 27 Conditions: Fuel - JP-4. Temperature - 57°F. R.H. - 100%. RAFB. Special Sample Configuration No. 2. Fifty-three gallons of fuel spilled as indicated on drawing. 1/18/72.

Time (min)*	Sample Point Numbers: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	40	35	280	330	60	1150	430	80	60	50	75	100	50	40	130	60	40	60	40	40	40	40	100	45
8	110	45	540	410	80	1580	650	175	100	60	80	65	50	45	70	60	40	90	215	90	45	210	980	140
12	190	65	[illegible]	580	105	1980	1940	580	180	90	240	155	75	60	190	100	45	275	140	60	55	180	260	225
16	280	75	1330	830	1300	2000+	2000+	650	235	110	110	90	70	60	75	70	100	185	160	780	120	190	300	360
20	440	120	1100	680	1690	2000+	2000+	600	270	155	330	250	150	120	360	215	100	230	190	240	120	195	390	375
24	500	170	1560	1490	1530	2000+	2000+	590	330	185	300	430	230	150	255	350	130	225	200	200	195	220	325	1175
28	740	210	1680	1320	1700	2660	1440	400	280	150	350	250	150	150	200	200	120	420	300	800	540	290	550	550
32	620	210	2000	1450	1200	2200	1650	535	340	235	295	305	230	250	335	260	165	375	295	345	180	340	470	480
36	590	220	1450	1930	990	2000+	2000+	560	380	225	405	420	245	170	400	340	145	260	190	365	160	305	265	635
40	720	425	1700	1180	650	2000+	2000+	490	340	240	500	400	210	280	570	280	190	270	190	535	170	180	430	350
44	540	295	1780	1350	850	2000+	2000+	480	365	175	450	355	240	310	430	335	185	235	200	445	190	215	320	375
48	600	250	1760	1580	1450	3000+	1765	510	400	320	490	425	330	310	390	330	250	455	220	570	225	230	485	680
52	650	175	1805	1860	1635	2000+	1560	535	380	270	440	440	300	375	345	335	275	350	295	345	190	315	565	570
56	660	270	1840	1860	1285	2000+	1370	410	350	255	295	270	200	215	375	245	330	330	220	610	175	235	345	545
60	590	445	2000+	1780	840	2000+	1240	345	300	255	380	275	210	255	350	245	300	200	200	400	150	125	180	390
64	570	160	1600	1300	1200	2400	1300	300	250	200	500	400	200	300	300	225	150	200	160	360	155	160	300	630
68	560	400	1880	1560	1845	2000+	1640	370	350	260	430	395	230	240	475	345	205	215	150	370	150	155	435	475
72	640	300	1560	1250	1520	2000+	1430	345	315	240	415	355	210	245	365	270	200	345	190	225	160	200	525	545
76	600	420	2000+	1860	1595	2000+	1440	385	360	300	460	355	230	310	420	290	255	350	185	265	180	180	350	350
80	630	370	1680	1300	1100	2000+	1500	370	325	285	480	380	225	315	440	285	200	255	165	215	160	165	325	380
84	500	345	1580	1360	440	1945	1210	310	295	370	480	375	245	440	440	360	195	240	175	265	160	170	245	190
88	450	350	1510	1180	350	1400	1100	275	280	305	755	555	235	400	370	250	175	315	155	190	135	145	185	170
92	390	290	1140	1080	315	1300	850	240	275	295	390	300	185	285	345	240	175	190	150	225	145	150	190	165
96	350	280	1070	1140	315	1080	720	230	245	260	385	300	200	280	385	250	180	175	140	180	150	140	170	160
100	355	250	1370	1300	395	1140	795	245	260	245	345	290	210	275	250	210	165	175	150	165	145	150	190	170
104	370	235	1350	1240	350	1500	1000	275	265	230	280	250	205	125	275	210	170	180	140	200	145	145	235	165
108	370	225	1030	990	285	1430	840	260	245	225	320	275	190	270	285	215	160	175	145	165	145	145	240	175
112	350	215	970	850	275	1070	740	240	240	225	275	230	190	265	270	700	160	165	145	165	150	145	170	155
116	295	215	1020	870	270	1490	950	260	240	225	305	240	180	215	295	210	160	155	140	160	140	140	320	170
120	320	205	780	790	325	1230	820	230	210	195	240	305	225	205	270	210	145	145	135	190	135	130	155	145
124	290	190	730	680	250	1350	850	230	220	200	280	245	170	210	245	190	150	150	135	160	130	135	145	145
128	270	210	970	810	245	730	485	185	200	220	310	235	175	245	275	205	155	195	130	135	120	125	210	150
**132	255	200	560	495	215	1080	610	185	195	185	345	330	210	190	290	255	150	185	130	300	140	130	175	185
***136	265	210	480	455	720	1580	920	270	275	235	290	265	215	230	250	220	190	190	175	305	180	165	200	375
140	370	250	875	835	540	700	480	230	245	275	355	335	260	325	365	310	300	180	185	230	210	185	190	275
144	355	305	490	490	315	415	350	220	250	250	300	285	250	245	265	285	195	200	210	195	190	200	185	235
****148	275	356	410	450	290	340	305	300	220	205	230	225	225	195	185	210	205	160	165	170	150	170	165	165
152	210	170	270	300	190	250	235	165	165	150	170	170	150	135	150	140	130	115	125	115	120	120	120	130
156	150	125	205	235	150	190	130	130	115	125	125	130	120	110	115	110	110	90	100	100	80	90	80	80
*****160	120	100	170	190	110	155	150	75	105	100	110	110	90	90	110	90	110	75	70	95	70	70	70	70
164	95	80	140	160	90	130	125	80	80	80	80	80	70	75	70	70	95	60	60	80	60	60	60	60
200	35	30	60	65	30	60	60	35	30	30	30	30	30	30	30	30	45	25	25	35	25	25	25	25
228	20	20	45	45	25	45	45	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec (e.g., Sample Point No. 2 is 20 sec. Sample Point No. 20 is 200 sec).

**Spread fuel out with brooms to double spill area at 132 min.

***Opened one pair of doors (1 at each end of the hangar and diagonally opposite) NW and SE.

****Opened two more pair of doors (NE and SW).

*****Opened three more pair of doors (NE and SW).

TABLE IV-28 FUEL CONCENTRATIONS IN PPM

Test 28 Conditions: Temperature - 46°-66°F. Field test at Bergstrom AFB with four RF-4 aircraft in Hangar 4534. 1/21/72 to 1/24/72.

Time (min)*	Sample Point Numbers																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
156	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
168	5	5	5	5	5	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	15	15	15	15
180	15	15	15	15	15	15	15	15	15	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10
192	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
372	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
720	10	10	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
732	10	10	25	15	10	10	20	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
744	10	10	25	10	10	10	20	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
756	10	10	30	15	10	10	15	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
804	10	10	30	15	10	10	20	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
816	10	10	25	15	10	10	50	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
828	10	10	45	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
840	10	10	20	15	10	10	20	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
852	15	10	15	15	10	10	40	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
846	10	10	25	15	10	10	25	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
876	10	10	15	15	10	10	45	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
888	10	10	10	10	10	10	20	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
996	10	10	10	10	10	10	25	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1008	10	10	10	10	10	10	30	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1020	10	10	10	10	10	15	20	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1032	10	10	10	10	10	10	50	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1044	10	10	10	10	10	10	45	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1056	10	10	20	10	10	10	100+	20	15	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1068	10	10	15	10	10	10	100+	25	15	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1080	10	10	15	10	10	10	100+	25	15	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1116	10	10	15	10	10	10	100+	25	15	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1128	10	10	15	10	10	15	100+	35	40	25	15	10	10	10	10	10	10	10	10	10	10	10	10	10
1140	10	10	55	20	15	15	100+	40	20	20	15	10	10	10	10	10	10	10	10	10	10	10	10	10
1152	15	10	20	15	15	15	100+	90	30	25	15	15	15	10	10	10	10	10	10	10	10	15	15	15
1164	15	15	50	20	20	20	100+	100+	30	25	15	15	15	15	15	15	10	10	10	10	10	15	15	15
1176	15	15	35	20	15	15	100+	100+	35	25	20	20	15	10	10	10	10	10	10	10	15	15	15	15
1188	15	15	100+	40	25	20	100+	150	35	50	20	15	15	10	10	10	10	10	10	10	10	10	10	10
1200	15	10	140	50	25	15	1000+	300	40	25	15	15	15	10	10	10	5	5	5	5	10	10	10	10
1212	10	10	35	20	15	15	1000	400	50	20	15	15	10	10	10	10	10	10	10	10	15	15	15	15
1224	15	15	30	20	20	15	765	285	40	30	15	15	15	10	10	10	10	10	10	10	10	10	15	5
1236	20	15	45	25	20	15	1000+	570	70	85	20	50	15	15	15	15	15	15	15	15	15	15	15	15
1248	15	15	135	30	20	20	985	405	115	45	20	20	15	15	15	15	10	10	10	10	20	20	20	20
1260	20	15	80	35	35	20	655	245	65	40	20	20	15	15	15	15	15	15	15	15	15	15	15	15
1272	20	15	140	30	20	20	870	355	50	35	20	20	15	15	15	15	15	15	15	15	15	15	20	20

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 30 sec (e.g., Sample Point No. 2 is 60 sec, Sample Point No. 20 is 600 sec).

TABLE IV-28 FUEL CONCENTRATIONS IN PPM (Cont'd)

Test 28 Conditions: Temperature - 46° -66°F. Field test at Bergstrom AFB with four RF-4 aircraft in Hangar 4534. 1/21/72 to 1/24/72.

Time (min)*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1296	20	15	30	25	20	20	740	220	40	45	20	20	20	15	15	15	15	15	15	15	15	20	20	20
1308	20	20	25	25	20	15	1000+	290	55	80	25	20	20	15	15	15	15	15	15	15	15	15	20	20
1320	20	15	30	25	20	15	795	385	160	70	20	20	15	15	15	15	15	15	15	15	15	15	15	15
1332	20	15	35	25	20	15	840	290	70	45	20	15	15	15	15	15	15	15	15	15	15	15	15	20
1344	20	15	55	40	20	20	1000+	290	75	65	20	20	15	15	15	15	15	15	15	15	15	15	15	15
1440	20	25	150	45	30	20	875	450	120	55	25	25	20	20	15	15	15	15	15	15	15	15	35	40
1452	20	25	150	45	35	20	1000+	260	55	35	25	125	20	15	15	15	15	15	15	15	15	15	30	45
1488	20	30	80	30	25	20	1000+	930	120	65	25	25	20	20	20	15	15	15	15	15	15	15	25	30
1536	35	25	40	35	30	25	105	275	36	20	10	10	10	10	10	10	10	10	10	10	10	15	15	15
1548	25	25	35	30	25	25	85	360	50	20	10	10	10	10	10	10	10	10	10	10	10	15	15	15
1560	20	20	25	25	20	25	105	145	35	20	10	10	10	10	10	10	10	10	10	10	10	15	15	15
1596	10	10	15	20	15	10	350	70	20	15	10	10	10	10	10	10	10	10	10	10	10	15	15	15
1680	10	10	10	10	10	10	40	180	25	15	10	10	10	10	10	10	25	25	25	5	10	10	10	15
1692	15	15	15	15	15	15	35	180	15	10	5	5	5	5	5	5	5	5	5	5	5	5	10	10
1704	10	10	10	10	10	10	30	75	15	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1884	10	10	10	10	10	10	115	25	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1908	10	10	10	10	10	10	20	35	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2424	10	10	10	10	10	10	50	15	10	15	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2508	10	10	35	15	10	10	375	135	35	25	15	15	15	10	10	10	10	10	10	10	10	10	10	10
2592	15	15	30	20	15	15	265	135	70	40	20	15	15	15	15	15	15	15	15	15	15	15	15	15
2664	20	15	95	45	30	20	1000+	270	60	35	20	20	15	15	15	15	15	15	15	15	15	15	20	15
2796	20	20	120	40	20	20	1000+	705	120	75	20	20	20	20	20	15	15	15	15	15	15	15	35	25
2916	20	20	215	55	40	30	1000+	730	95	35	35	50	30	30	20	20	20	20	20	20	40	30	25	30
2928	25	20	45	30	20	30	990	505	115	40	25	25	20	25	15	15	15	15	15	15	15	15	25	25
3024	15	15	20	15	15	25	70	100	20	15	10	10	10	10	10	10	10	10	10	10	10	15	15	15
3144	5	5	5	5	5	25	35	50	10	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10
3156	5	5	5	5	5	25	35	50	10	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10
3168	15	10	10	10	10	30	35	55	20	15	15	10	10	10	10	10	10	10	10				15	15
3216	15	15	15	15	15	25	30	100+	30	15	10	10	10	10	10	10	10	10	10	10	10	10	10	15
3696	5	5	5	5	5	10	15	60	15	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 30 sec (e.g., Sample Point No. 2 is 60 sec, Sample Point No. 20 is 600 sec).

TABLE IV 29. FUEL VAPOR CONCENTRATIONS IN PPM

Test 29 Conditions: Fuel - avgas. Temperature - 69°F. R.H. - 55%. Sample Configuration No. 4. Four gallons of avgas in a spill at the center of the east wall. 2/14/72.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	100	100	500	100	200	1000	1400	2800	1800	1500	1100	1300	1300	800	1000	700	1000	1400	3000	3000	5900	9400	13400	20000+
12	19500	16000	8600	7700	4500	3300	2100	800	600	400	400	400	400	400	400	600	700	2100	3600	4800	6500	12100	16100	20000+
24	19800	16900	11500	9200	6400	4100	2900	1600	800	800	400	400	400	400	800	900	1100	2800	4100	5800	8500	11300	14200	19200
36	18200	16100	10600	8800	7100	5200	3900	2500	1000	600	500	500	500	600	600	1300	2900	4400	5200	6200	7100	9900	12800	17800
48	17100	13900	8900	6800	6000	5000	4700	3300	1800	1000	700	600	600	600	900	2000	3600	4300	4600	4800	6300	8600	12100	15500
60	16000	13200	8400	7000	5600	4600	4200	3600	2100	1300	600	600	700	600	1200	2400	3400	4400	4600	4700	6100	7500	10100	15500
72	15000	11900	7300	6300	5100	4300	4400	3900	3200	2900	1500	800	800	1100	1900	3300	3600	4100	4400	4400	5000	7500	9700	14300
84	12800	11900	6800	5600	4200	3900	3500	3500	2200	1400	800	900	900	800	800	900	2500	3300	3600	3500	4800	6500	8400	12600
96	11900	10300	6700	5100	4100	3300	3000	2500	1800	1300	1100	1000	800	800	800	1500	2500	2800	3100	3400	3200	4900	7300	12100
108	10700	8300	4800	4000	3600	3200	3000	2800	2100	1700	800	900	800	900	1000	1900	2500	2500	2600	2500	3400	4900	7300	11000
120	8400	6700	4800	3900	2700	2500	2200	1900	900	700	700	700	700	600	600	600	600	1300	1500	2300	3300	4800	6800	10400
132	9800	8000	4300	3700	3100	2000	1500	1100	80C	600	600	600	600	600	600	600	900	800	1400	1300	2700	2700	4300	7800
216	6700	4650	2750	1850	950	600	800	850	850	950	900	900	900	1000	1000	950	950	1200	1300	1350	1700	2600	3850	6550
288	4150	3000	1150	1250	850	750	500	500	550	550	550	600	550	500	550	440	440	900	900	900	1550	2000	3400	5200
384	2300	1500	900	700	550	500	400	250	300	250	250	250	250	250	250	250	300	500	500	850	750	800	1900	2950
480	3100	2500	1150	750	700	750	600	350	250	250	250	250	250	250	250	250	300	500	400	400	500	1650	2250	3500
576	3200	2700	1250	750	500	500	450	450	450	450	450	450	450	450	500	600	600	550	500	500	500	850	2150	3450
672	2000	1400	700	550	600	600	600	600	600	650	650	650	650	650	650	600	650	600	600	600	600	600	1200	2650
720	600	700	550	450	500	450	450	450	450	450	450	340	450	450	450	500	500	400	400	400	400	450	650	700
816	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	550	550	550	500	500	500	500	500

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 30 sec (e.g., Sample Point No. 2 is 60 sec, Sample Point No. 20 is 600 sec).

TABLE IV 30. FUEL VAPOR CONCENTRATIONS IN PPM

Test 30 Conditions: Fuel - avgas. Temperature - 82°F. R.H. - 43%. Sample Configuration No. 3. Four-gallon spill with floor fan operating part time to simulate draft under hangar door

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	20	100	100	80	700	350	650	18600	20000+	20000+	20000+	20000+	2250	3600	1300	750	650	800	850
12	700	400	300	300	250	340	250	450	850	4900	3800	3200	18400	20000+	20000+	20000+	18900	5200	7350	2900	2000	800	950	800
24	1050	700	600	550	400	350	850	1100	2850	7250	6650	6700	17850	20000+	20000+	20000+	17950	7500	8700	4900	3100	900	1000	800
36	1150	900	700	600	600	500	1350	2000	5205	7650	7050	6400	16550	19100	19800	20000+	16300	8050	8550	5450	4250	1100	1300	800
48	1400	1000	850	700	650	550	2000	2500	5500	7350	5400	7300	14700	17500	18550	19550	16150	7300	7900	5650	4400	1150	1300	700
60	1500	1200	1000	950	900	650	2100	2450	5100	6750	4800	5300	13800	16600	17400	18600	15000	7100	7450	5250	4000	1150	1350	650
72	1550	1300	1150	800	900	800	1100	1900	4000	6100	4550	3950	13000	15650	16750	17800	14550	6900	6850	4450	3550	1250	1450	600
84	1600	1350	1200	1200	1000	750	1000	1500	2500	5350	3450	4350	12250	14700	15900	16750	12050	5750	5900	3600	2150	1350	1400	550
96	1600	1450	1250	1200	850	800	1100	1150	1350	4750	3450	2450	11450	13950	15050	16500	13000	5050	5300	3600	2100	1250	1450	550
108	1550	1400	1250	1200	1050	800	1050	1350	1250	3450	4600	3350	10600	13800	14850	15750	12900	5550	5150	3350	1900	1350	1650	500
120	1750	1500	1300	1500	1100	950	1150	1450	1300	4000	3350	1800	11200	13950	15100	16150	12550	3550	4500	2900	1200	1350	1500	550
132	1700	1550	1500	1350	1200	1100	1200	1300	1300	3000	2050	1300	10950	13550	14650	15650	12450	2550	4150	2850	1500	1450	1550	550
144	1700	1650	1550	1500	1200	1200	1250	1300	1350	1500	2550	1450	10400	13300	14250	15250	12600	2850	4100	2650	1600	1500	1650	550
156	1700	1650	1500	1500	1300	1150	1250	1300	1400	1750	2050	1400	10200	12700	13900	14750	12100	2000	3600	2500	1600	1500	1550	500
168	1650	1700	1550	1400	1350	1150	1300	1300	1400	1550	2300	1400	9500	12050	13150	14450	11350	2200	3700	2450	1500	1400	1540	500
180	1700	1550	1500	1350	1150	1050	1250	1300	1350	1550	2050	1300	8200	11100	12250	13250	9650	2050	3000	2200	1550	1600	1600	450
192	1600	1550	1400	1300	1300	1000	1250	1300	1350	1300	1500	1250	8150	9900	11450	12550	9100	2000	2850	2150	1500	1450	1550	400
204	1500	1350	1150	1200	1300	1000	1200	1200	1250	1250	1500	1200	6700	9250	10500	11800	7950	2000	1850	1750	1650	1650	1600	400
216	1500	1450	1300	1250	1150	900	1200	1200	1250	1200	1400	1150	5300	8350	9950	10900	7300	1650	2150	1750	1450	1450	1450	350
**228	1500	1250	1300	1400	1150	1250	1400	1300	1800	2100	1350	1250	2350	4600	6400	8050	4700	1450	2100	1440	1350	1150	1300	100
240	1300	1350	950	1300	1050	850	1150	1350	1100	1000	1350	1150	4200	6300	8000	9100	6200	1350	2350	1500	1450	1400	1400	250
***252	1100	1250	1000	1700	1850	1700	1850	1850	1850	1850	1850	1850	2050	2200	2250	2250	2000	1900	1900	1850	1900	1900	1900	100
****264	1400	1525	1325	1775	1825	1759	1750	1825	1750	1600	1725	1650	1775	1900	2825	4500	3175	1750	1825	1775	1659	1775	1825	150
276	1525	1525	1525	1775	1750	1775	1625	1650	1650	1700	1650	1650	1725	2500	5200	6300	4475	1750	2175	2125	1675	1725	1725	225
288	1450	1600	1500	16751	1725	1450	1625	1825	1675	1650	1875	1675	2775	4100	6000	7000	4950	1800	2250	2050	1825	1775	1825	250
300	1350	1600	1500	1650	1700	1225	1675	1725	1675	1625	1700	1575	2975	4600	6350	7200	4825	1675	2350	1975	1600	1750	1750	275
312	1350	1550	1325	1650	1825	1225	1675	1750	1625	1550	1600	1475	3250	4750	6625	7275	5350	1500	2375	2050	1500	1125	1725	250
324	1425	1475	1300	1575	1725	1375	1500	1575	1550	1425	1525	1500	3050	4775	6900	7400	5175	1650	1875	1900	1575	1650	1625	275
336	1500	1500	1325	1525	1675	1125	1525	1450	1525	1425	1525	1425	3175	4525	6225	7000	5050	1575	2275	1800	1425	1650	1575	275
348	1300	1400	1175	1500	1500	1150	1350	1500	1400	1325	1375	1300	3450	4650	6600	6925	5750	1475	2375	1850	1425	1475	1550	250
360	1200	1300	1100	1350	1225	1050	1475	1375	1275	1300	1275	1275	3575	4800	6550	6975	5325	1650	2400	1925	1525	1500	1500	250
372	1225	1300	1125	1300	1175	1000	1375	1375	1300	1250	1250	1250	3050	4675	6675	6975	5250	1650	2325	1825	1250	1475	1450	300
384	1175	1225	1100	1200	1100	1025	1225	1350	1225	1200	1200	1175	3650	4950	6700	6850	5275	1700	1850	1675	1350	1350	1425	225
396	1200	1175	1025	950	1075	950	1225	1275	1150	1100	1150	1075	3475	4600	6425	6575	5275	1600	1675	1575	1200	1360	1425	225
408	1150	1150	975	1050	1225	1125	1100	1175	1100	1025	1125	1050	3100	4450	6150	6350	4875	1400	1650	1375	1250	1200	925	200
420	1100	1100	975	1050	1150	1100	1175	1150	1100	1050	1100	1025	3450	4350	6225	6300	5000	1675	1825	1375	1400	1250	1075	200
432	1100	1100	1050	1100	1150	1000	1050	1200	1050	1025	1075	[illegible]	3200	4375	6075	6200	4950	1700	1400	1325	1325	1175	1050	200
444	1050	1075	1050	1075	1000	1075	950	1200	1025	975	1050	975	3375	4250	6050	6125	5000	2050	1750	1175	1400	1200	1050	200
456	1075	1100	1050	1000	1000	975	950	1175	1000	975	1025	950	2400	4100	5750	5950	4650	1325	1050	1100	1375	950	1000	175
576	725	725	725	725	725	700	700	700	675	650	650	675	700	575	675	1225	975	700	675	675	675	700	700	75
588	700	700	700	700	675	675	675	675	675	650	650	650	700	550	650	725	800	725	700	675	725	675	675	75
600	675	675	675	675	675	675	675	675	675	650	675	675	700	600	650	725	1050	700	700	700	675	675	675	75
708	5	15	10	10	10	10	5	55	55	60	50	45	40	30	30	30	0	30	15	0	10	10	60	0

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 30 sec (e.g., Sample Point No. 2 is 60 sec, Sample Point No. 20 is 600 sec).
**Entered room to set up fan.
***Fan turned on.
****Fan off.

TABLE IV-31 FUEL VAPOR CONCENTRATIONS IN PPM

Test 31 Conditions: Fuel - JP-4. Temperature - 89°F. R.H. - 28%. Sample Configuration No. 3. Four-gallon spill with floor fan operating part time to simulate draft under hangar door.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	100	50	50	100	75	80	200	80	200	200	100	50	400	2150	3500	5000	900	275	550	225	175	250	275	50
24	200	100	100	200	150	175	125	150	450	325	175	100	750	4925	7175	10150	1800	375	325	259	299	225	275	150
36	225	125	100	200	150	150	150	150	275	225	125	250	800	3725	7400	8675	2450	350		275	200	225	225	150
48	200	150	100	150	125	125	125	125	350	300	150	125	500	2975	5025	7875	2250	275	325	225	225	200	250	150
60	200	125	100	150	150	100	125	125	350	200	125	125	300	2825	4325	6075	1800	300	300	275	200	175	225	cal
72	cal	cal	cal	350	125	125	125	100	200	200	100	100	225	1775	3650	4725	2800	250	250	200	150	125	150	125
84	150	100	75	75	75	50	125	75	150	225	100	75	200	1425	3400	4900	1375	250	300	200	175	125	175	125
96	175	100	75	100	50	50	100	100	125	125	50	125	75	1275	3000	4300	1550	250	250	175	150	125	125	100
108	150	75	75	100	75	50	100	75	175	75	75	100	150	1050	2950	3925	1625	225	325	175	150	125	125	125
120	150	75	75	75	50	50	100	75	172	125	75	75	75	950	2500	3700	1650	175	275	175	125	100	100	100
132	125	75	75	75	50	50	50	50	125	100	75	75	75	775	2075	3175	1125	150	225	150	100	75	100	100
**144	125	75	100	125	50	50	50	50	75	100	25	25	50	500	2075	2750	1200	125	125	125	225	200	150	75
156	75	50	50	150	250	225	250	300	300	300	325	325	475	325	575	600	600	400	475	450	375	375	350	25
***168	125	100	100	275	350	350	350	375	375	375	375	400	550	375	550	575	700	475	425	400	400	425	425	50
180	225	175	150	325	275	350	350	350	350	300	250	225	225	200	750	1850	600	350	400	350	325	225	275	75
192	200	150	125	275	250	275	225	300	275	200	250	175	175	200	1025	2125	675	275	300	275	250	200	200	75
204	150	125	100	175	200	150	225	225	200	150	150	125	125	125	850	2375	850	200	350	200	175	150	175	75
216	150	100	100	125	100	100	200	175	200	225	125	125	100	175	675	2325	725	175	275	200	150	125	125	75
288	125	75	75	75	50	50	150	75	100	125	75	75	75	75	450	2325	575	125	275	150	100	75	100	75
432	200	175	175	150	150	150	150	150	150	150	150	150	150	125	400	1525	450	175	250	175	150	150	175	75
576	275	275	275	275	275	275	325	275	300	300	300	300	375	300	350	400	325	325	375	375	325	325	325	50
720	250	250	275	275	275	275	275	275	275	257	275	275	275	275	275	300	325	300	300	300	300	300	300	50
1104	150	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	0

*The time shown corresponds to Sample Point No. 1. Each Sample Point beyond No. 1 is spaced 30 sec (e.g., Sample Point No. 2 is 60 sec, Sample Point No. 20 is 600 sec).
**Fan on (156 min).
***Fan off (174 min).

TABLE IV-32 FUEL VAPOR CONCENTRATIONS IN PPM

Test 32 Conditions: Fuel - avgas. Temperature - 90°F. R.H. - 40%. Sample Configuration No. 3. Four-gallon drip test with floor fan operating part time to simulate draft under hangar door.

Time (min)*	Sample Point Numbers: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	75	75	75	75	75	160	100	100	150	300	425	250	4575	7300	9450	10000	1350	1000	1075	925	725	425	500	300
12	475	300	350	300	300	275	1550	800	1025	1750	1000	1950	10000+	10000+	10000+	10000+	10000+	2075	2975	2175	1525	775	800	550
24	850	650	675	525	525	550	1325	1425	1500	3075	1650	2675	10000+	10000+	10000+	10000+	10000+	3450	5025	3275	1925	1075	1125	675
36	1225	950	975	900	825	750	2925	2125	3250	4275	2625	4675	10000+	10000+	10000+	10000+	10000+	5075	7125	5225	2925	1525	1775	775
48	1750	1325	1425	1225	1150	1100	4075	3150	4875	6425	3775	5500	10000+	10000+	10000+	10000+	10000+	6900	7900	6650	cal	cal	cal	950
60	1650	1300	1300	1300	1200	1150	3700	3450	5300	6050	4500	6300	18600	20000+	20000+	20000+	20000+	7200	8200	6650	6000	2250	1950	900
72	1850	1500	1450	1500	1300	1300	5000	4150	6100	7150	4250	6350	19900	20000+	20000+	20000+	20000+	7900	8500	7250	6500	2250	1900	900
84	1900	1550	1500	1500	1400	1300	5000	3800	6350	7000	5400	6950	19750	20000+	20000+	20000+	20000+	6900	8850	7450	6500	2300	2250	900
96	1900	1500	1400	1450	1350	1300	cal	cal	cal	7800	5750	5550	19600	20000+	20000+	20000+	20000+	7900	8500	7600	7300	2600	2000	900
108	1900	1400	1500	1500	1400	1350	5500	4450	6800	6700	5500	6800	19100	20000+	20000+	20000+	20000+	6950	8300	7100	6700	2450	2100	900
120	1900	1500	1400	1450	1400	1400	5750	5550	6350	6250	5200	5750	18550	20000+	20000+	20000+	20000+	6800	8150	7100	6750	3000	3250	900
132	1900	1500	1450	1650	1450	1800	5400	5600	6100	6150	5500	5700	17800	20000+	20000+	20000+	20000+	6600	7750	6700	6200	3400	2800	900
144	1800	1350	1200	1350	1400	1300	5150	5400	5850	6150	4750	5550	18450	20000+	20000+	20000+	20000+	6500	8200	7000	5850	3700	3900	900
156	1850	1450	1350	3000	2750	3450	5100	5100	5750	6200	5300	5500	16700	20000+	20000+	20000+	18700	6600	6700	6300	5400	5900	5850	1000
168	1900	1550	1450	5200	4700	4700	5200	4100	5400	5600	5000	5450	14350	19700	20000+	20000+	16900	5100	6100	5700	4850	5500	5550	900
180	2100	1700	1650	4600	3650	4750	4850	4700	4950	5000	4500	4800	13500	18000	20000+	20000+	16800	5000	5700	5200	4800	5250	5150	850
190	2100	1750	1550	4400	3500	4750	4900	3800	4800	5150	3650	4700	14150	18400	20000+	20000+	17600	4250	6650	5950	4950	5000	4950	850
204	2400	2000	1850	4000	4250	4200	4650	4200	4800	5000	4000	4300	13650	17500	20000+	20000+	17350	5050	6500	5300	4700	4700	4700	850
216	2600	2250	2250	4000	4000	4200	4450	3300	4600	4900	3750	4150	13800	18000	19900	20000+	16200	4900	6550	5500	5100	4700	4600	800
228	2900	2600	2500	3900	3900	3900	3950	3350	4550	5000	4000	4200	13100	16650	18800	20000+	14900	5100	5700	5000	4300	4300	4450	800
240	3500	2900	2500	3500	2800	3700	3500	3400	4050	4550	3600	3900	12400	16300	18300	19850	14150	4700	5400	4200	4250	3950	4750	750
252	3500	3050	3000	3100	2900	3300	3150	2650	4200	4200	3700	4350	11550	16050	17350	19100	13800	4750	4500	4350	3650	3400	3350	700
264	3100	3100	3100	3000	2650	3100	3100	2850	4050	4000	3150	3200	9100	12750	13800	15600	10600	3850	3350	3350	2900	3350	3450	650
276	3000	3000	3000	3000	2600	2800	2600	2400	2800	2400	2500	2700	5950	10450	11400	12950	7550	3150	3650	3250	2450	2900	2800	550
288	2450	2700	2700	2600	2600	2200	2300	2050	2500	2350	2100	2350	5700	9650	10450	11800	7450	2550	3350	2900	2300	2600	2500	500
420	540	620	545	655	575	670	510	465	525	555	460	565	500	830	275	410	160	605	635	625	605	560	630	135
**432	475	585	535	550	600	650	650	675	665	650	625	605	705	770	930	865	595	490	595	605	540	590	610	60
444	540	560	560	615	640	640	640	650	645	640	660	645	705	750	805	755	410	425	575	585	555	580	595	75
***456	525	540	540	585	595	600	605	605	950	580	600	590	635	675	730	635	290	400	400	490	510	495	510	65
468	465	475	480	520	535	535	535	535	530	530	545	535	585	615	645	605	420	365	445	495	410	475	480	60
480	410	445	445	480	485	485	480	475	470	465	475	465	515	545	555	545	435	415	435	435	405	435	425	55
492	375	395	385	445	440	450	465	400	315	280	410	465	285	490	630	790	160	150	585	440	245	365	445	55
576	145	165	155	160	150	170	180	185	160	160	140	140	105	185	665	245	95	110	105	105	[illegible]	145	130	25
720	65	65	70	75	70	70	105	100	115	105	105	95	60	80	175	95	65	90	65	75	95	80	80	15
1008	75	80	80	85	85	85	85	65	95	95	85	85	85	90	155	90	50	85	75	85	85	85	85	15
1404	60	60	65	65	65	65	65	65	65	65	65	65	65	65	80	75	40	65	65	65	65	65	65	15

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 30 sec (e.g., Sample Point No. 2 is 60 sec, Sample Point No. 20 is 600 sec).
**Fan on.
***Fan off

TABLE IV-33. FUEL VAPOR CONCENTRATIONS IN PPM

Test 33 Conditions: Fuel - JP-4. Temperature - 85°F. R.H. - 48%. Sample Configuration No. 3. Four-gallon drip test with floor fan operating part time to simulate draft under hangar door.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	100	100	100	100	100	100	200	100	100	300	300	400	2600	1800	4800	4800	1000	800	1000	700	300	200	200	100
12	300	200	200	200	200	200	300	400	500	700	1100	600	5600	7400	8900	9800	7400	1300	2900	1700	800	700	500	300
24	600	500	500	400	400	400	700	100	900	1800	1300	1900	8700	12000	2600	14000	11000	1900	2500	1900	1000	1000	800	400
36	900	700	700	600	600	600	1300	1200	1600	2800	1900	2700	11500	14900	15700	17400	14300	3100	4500	2900	1800	1000	900	500
48	1000	800	800	800	800	800	2100	2000	2100	3800	2500	3600	13000	16800	17400	19500	15400	3900	5200	4300	3100	1300	1100	600
60	1300	900	900	900	900	800	200	1600	2500	3200	3000	3800	14100	17000	20000+	20000+	16400	4500	5400	3700	2500	1300	1200	700
72	1300	1000	900	900	900	8800	1000	1000	1800	1800	1800	1200	12400	16400	17500	19000	14600	3300	2600	2200	1600	1100	1100	600
84	1300	900	800	900	900	800	1300	900	1900	2200	1600	1900	11300	15300	18400	17800	12400	2100	2600	2200	1200	1100	1100	600
96	1200	900	800	1000	900	900	1100	900	1100	1100	1000	1000	5500	9100	11500	13000	8200	1500	1800	1200	1100	1000	1000	500
108	1100	800	800	800	800	800	800	800	1100	1000	900	1000	5800	9700	11500	12800	8300	1300	1300	1100	1100	900	1000	500
120	1000	700	700	800	800	800	1400	1200	1000	1200	1000	1200	7500	11000	12000	13000	9300	1700	2100	1600	1100	1000	1000	500
132	1100	800	700	1500	1800	1700	2000	2200	1900	1900	1900	2100	3000	3000	2800	2600	2300	2000	2000	2000	2000	1950	1975	275
144	1625	1700	1725	2125	2300	2200	2250	3075	2200	2225	3050	3000	2975	2625	2640	2450	2450	2275	2250	2250	2275	2300	2100	300
156	2000	1675	1800	2200	2250	2225	2150	2200	2450	2425	2150	2075	2950	3000	7300	6700	4600	2300	2400	2250	2250	1950	1700	375
168	1550	1350	1350	1600	1700	1550	1700	1900	2100	1900	1850	1550	4000	5300	7850	8350	5850	1900	2100	1800	1800	1600	1450	350
180	1300	1150	1100	1450	1450	1250	1450	1650	1600	1450	1400	1300	5200	6950	9350	9600	5550	1550	2450	1850	1500	1600	1450	400
192	1200	900	900	1300	1250	1100	1200	1250	1300	1200	1850	1600	6250	8350	10600	11000	8300	2400	2400	1700	1700	1500	1100	400
204	1000	800	800	1000	1100	900	1000	1000	1200	1100	1500	1000	5200	7400	10000	10300	6800	1600	2000	1400	1500	1500	1100	400
216	1000	800	700	1200	1200	1000	1000	1100	1100	900	1500	900	5300	7900	9600	10400	6700	1300	1800	1600	1100	1400	1000	400
228	800	700	700	1100	1200	900	900	1000	1000	1200	1100	900	3300	5000	7400	8600	5300	1100	1400	1100	1000	1200	1100	400
240	800	700	600	1100	1100	800	800	1000	1000	1000	1000	800	2500	3900	6300	7000	3600	1000	1200	1000	1000	1000	1000	300
252	700	600	500	800	1000	800	800	1000	900	900	900	800	2000	3200	5900	6700	4000	900	1300	1000	900	1000	800	300
264	cal	cal	cal	cal	cal	cal	700	750	800	900	700	600	1150	1900	3300	5100	2500	750	950	900	750	850	700	250
276	600	500	450	750	750	700	600	650	800	700	650	550	1000	1700	3800	4550	3000	750	900	750	700	750	650	250
288	500	450	500	650	650	550	550	650	650	750	650	500	700	1150	3100	3900	2600	700	950	850	700	700	500	250
300	450	300	350	550	575	525	625	550	575	525	500	450	550	1000	2425	3450	2750	900	675	625	550	650	475	200
312	425	350	350	550	500	450	450	500	550	550	500	475	525	900	2575	3475	1800	725	750	625	600	600	600	225
324	425	375	375	500	525	500	500	500	600	600	500	450	500	750	2475	3300	2150	800	775	725	550	575	525	225
336	450	400	350	450	525	450	500	500	500	725	500	450	500	700	1950	3075	1925	650	775	625	525	600	475	200
348	450	375	350	475	475	450	500	500	500	550	475	450	475	575	1700	2700	2075	625	600	550	525	575	450	200
360	400	350	325	450	450	425	475	425	475	500	425	425	425	550	1950	2500	1750	650	725	525	600	575	425	200
372	375	325	300	425	450	375	425	425	450	500	400	375	400	425	1625	2300	1950	575	525	500	500	525	400	200
384	350	300	375	400	400	400	450	350	400	400	400	375	375	400	1450	2125	1525	550	550	450	400	500	375	200

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 30 sec (e.g., Sample Point No. 2 is 60 sec, Sample Point No. 20 is 600 sec).
**Fan on 132 min; fan off 156 min.

TABLE IV-34 FUEL VAPOR CONCENTRATIONS IN PPM

Test 34 Conditions: Fuel - avgas. Temperature - 75°F R H - 60% Sample Configuration No. 4. Four gallons of avgas in a spill in the center of the east wall. 6/6/72.

Time (min)*	Sample Point Numbers																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	800	14,500
1	18,400	12,800	9,250	5,500	3,700	2,400	3,000	1,950	1,800	1,450	1,150	1,300	1,200	2,400	2,350	3,150	5,800	8,000	10,300	12,200	13,600	14,900	16,000	16,700
13	17,600	16,600	15,900	14,900	13,600	12,600	11,500	10,500	9,800	8,750	8,100	6,700	7,100	7,800	8,700	9,200	10,100	11,000	12,100	13,100	13,800	14,800	15,600	16,300
25	16,900	16,400	15,700	14,900	14,000	13,200	12,200	11,300	10,600	9,600	8,800	7,800	8,100	8,300	8,900	9,600	10,000	11,700	12,700	13,400	14,100	14,800	15,500	16,000
37	16,800	16,300	15,600	14,700	14,100	13,300	12,400	11,600	10,800	10,000	9,000	8,200	7,700	8,100	8,800	9,800	10,600	11,600	12,500	13,200	13,900	14,700	15,200	15,800
49	16,300	16,100	15,400	14,600	13,800	13,000	12,100	11,300	10,500	9,500	8,600	7,800	7,300	7,800	8,400	9,300	10,300	11,300	12,100	13,000	13,700	14,500	15,100	15,600
61	16,100	15,900	15,200	14,500	13,700	12,900	12,100	11,200	10,300	9,100	8,100	6,700	6,400	7,100	8,200	9,200	10,300	11,300	12,100	12,900	13,500	14,300	14,800	15,400
73	15,900	15,700	15,000	14,300	13,400	12,700	11,700	10,800	10,000	8,800	7,900	8,600	7,600	7,000	8,000	7,900	8,300	9,000	9,500	10,400	11,100	12,200	13,100	14,100
85	15,200	14,700	13,400	12,500	11,500	10,600	9,700	8,900	8,100	7,000	6,400	6,000	5,900	5,900	5,900	6,400	7,000	8,300	9,400	10,500	11,300	12,600	13,600	14,200
97	15,100	14,500	13,400	12,500	11,300	10,300	9,100	7,900	6,700	5,400	5,000	4,500	4,600	4,700	5,000	5,500	6,600	8,100	9,500	10,600	11,700	12,700	13,400	14,200
109	15,000	14,500	13,500	12,700	11,800	10,800	9,600	8,500	7,100	5,800	5,300	4,600	4,600	4,600	4,700	5,000	5,400	6,300	7,600	9,200	10,400	11,800	12,800	13,700
121	14,800	14,030	12,800	11,800	10,600	9,400	8,100	6,600	5,700	4,600	4,200	3,500	3,600	3,600	3,600	4,000	4,500	5,700	7,400	9,300	10,400	11,800	12,700	13,700
133	14,700	13,900	12,800	11,900	10,700	9,500	8,200	6,500	5,600	4,600	4,300	3,600	3,700	3,600	3,900	4,200	4,700	5,100	6,700	8,400	9,700	11,200	12,300	13,200
145	14,[illegible]	13,500	12,200	11,300	10,000	8,700	6,800	5,300	4,600	3,700	3,700	3,500	3,600	3,700	3,700	3,800	3,600	4,000	5,200	6,500	8,700	10,500	11,800	12,900
157	14,300	13,200	11,700	10,400	8,800	6,900	5,400	4,400	4,200	3,400	3,400	3,000	3,200	3,200	3,300	3,200	3,600	3,600	4,700	6,000	7,800	10,100	11,300	12,500
169	14,000	12,700	11,200	9,800	7,500	5,400	4,200	3,200	3,100	2,600	2,700	2,500	2,800	2,400	2,800	2,500	3,000	2,800	3,100	3,100	3,900	6,000	9,300	11,400
181	13,500	11,400	8,900	5,700	4,300	2,900	3,000	2,300	2,500	2,100	2,300	2,000	2,300	2,100	2,400	2,200	2,500	2,100	2,900	2,500	4,100	5,500	8,800	10,800
193	13,200	10,700	8,100	4,600	3,800	2,600	2,600	2,200	2,300	2,000	2,100	1,900	2,000	1,000	2,000	1,900	2,200	1,900	2,400	2,200	3,100	4,100	7,500	10,000
205	12,800	10,000	6,900	4,000	3,30	2,300	2,300	1,900	2,100	1,900	2,000	1,900	1,900	1,800	1,900	1,800	1,900	1,800	2,200	2,100	3,000	4,200	7,200	10,000
217	12,500	9,500	6,300	3,500	3,100	2,100	2,100	1,800	1,800	1,700	1,700	1,600	1,600	1,600	1,600	1,500	1,600	1,400	1,800	1,800	2,600	3,400	5,800	9,000
229	12,200	8,700	5,700	3,300	2,900	1,900	2,000	1,600	1,700	1,500	1,500	1,400	1,400	1,400	1,500	1,400	1,500	1,300	1,800	1,500	2,400	3,000	5,700	8,400
241	12,000	8,000	4,900	2,800	2,500	1,700	1,800	1,400	1,600	1,400	1,300	1,200	1,400	1,200	1,400	1,200	1,400	1,200	1,700	1,300	2,300	2,600	5,000	7,700
253	11,600	7,300	4,700	2,500	2,200	1,400	1,600	1,200	1,300	1,300	1,100	1,200	1,000	1,000	1,000	1,000	1,300	1,000	1,400	1,000	1,900	2,000	4,500	7,100
265	11,300	6,600	4,100	2,300	2,100	1,300	1,400	1,000	1,100	900	1,000	800	800	800	800	800	1,100	800	1,300	1,000	2,000	2,300	4,500	7,000
277	11,100	6,300	4,100	2,300	2,100	1,300	1,400	1,000	1,000	800	800	800	800	800	900	800	1,000	800	1,300	1,000	2,000	2,200	4,400	6,700
289	10,800	6,000	3,800	2,000	1,900	1,100	1,300	900	1,000	800	800	800	800	800	900	800	1,000	700	1,300	900	2,000	2,200	4,500	6,500
301	10,700	6,100	4,100	2,200	2,100	1,200	1,300	900	900	800	900	800	800	800	900	700	1,000	600	1,300	800	1,700	1,900	3,900	5,700
313	10,400	5,300	3,500	1,800	1,700	1,100	1,200	800	1,000	800	900	800	900	700	900	700	900	600	1,000	800	1,700	1,600	3,600	5,100

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 30 sec.

TABLE IV-35. FUEL VAPOR CONCENTRATIONS IN PPM

Test 35 Conditions: Fuel - JP-4. Temperature - 80°F. R.H. - 65%. Sample Configuration No. 4. Four gallons of JP-4 in a spill in the center of the east wall. 6/13/72.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15	17	18	19	20	21	22	23	24
0	8,700	8,200	3,300	3,500	1,100	900	800	400	300	200	200	100	100	100	100	100	300	300	900	1,500	5,700	8,500	9,900	10,900
4	12,200	10,100	9,000	7,500	5,300	2,600	1,800	800	800	400	400	300	400	300	600	400	1,900	3,100	5,400	7,200	8,400	9,500	10,300	11,000
8	11,900	10,500	9,800	9,000	7,900	6,700	4,900	3,200	2,300	1,300	1,300	700	900	800	1,500	1,900	3,500	5,000	7,100	8,200	9,000	9,800	10,400	11,000
12	11,700	10,600	10,000	9,400	8,600	7,800	6,800	4,900	3,700	2,200	1,900	1,000	1,200	1,100	2,300	2,900	4,900	6,500	7,700	8,500	9,200	9,900	10,500	11,000
16	11,600	10,600	10,100	9,500	8,800	8,100	7,200	5,800	4,200	2,600	2,200	1,300	1,500	1,500	2,700	3,300	5,600	6,800	7,900	8,600	9,300	9,700	10,400	10,900
20	11,500	10,600	10,000	9,500	8,800	8,100	7,500	6,500	6,000	4,000	3,400	2,200	2,400	2,700	4,100	5,300	6,800	7,500	8,300	8,700	9,200	9,800	10,200	10,700
24	11,500	10,400	9,900	9,500	8,900	8,400	7,900	7,200	6,600	5,300	4,500	3,100	3,600	3,700	5,800	6,300	7,100	7,700	8,300	8,800	9,300	9,800	10,100	10,600
28	11,400	10,300	9,900	9,500	9,000	8,600	8,200	7,600	7,100	6,200	5,500	3,900	3,900	4,400	5,900	6,700	7,300	7,900	8,500	8,800	9,300	9,800	10,100	10,600
32	11,200	10,300	9,900	9,500	9,000	8,600	8,100	7,600	6,900	6,000	5,100	3,400	3,400	3,900	5,300	6,200	7,000	7,700	8,100	8,800	9,200	10,100	10,100	10,500
36	11,200	10,300	9,900	9,500	9,000	8,600	8,100	7,600	6,900	5,900	5,100	3,500	3,500	3,900	5,200	6,100	7,000	7,600	8,100	8,700	9,200	9,700	10,100	10,500
56	10,800	10,000	9,400	9,200	8,900	8,300	7,800	7,300	6,800	6,000	5,400	4,400	4,300	4,700	5,800	6,300	7,000	7,500	8,000	8,300	8,800	9,200	9,800	10,200

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec.

TABLE IV 36. FUEL VAPOR CONCENTRATIONS IN PPM

Test 36 Conditions: Fuel - avgas. Temperature - 88°F R H - 98% Sample Configuration No. 4. Four gallons of avgas in a spill in the center of the east wall 6/13/72.

Time (min)*	Sample Point Numbers: 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
0	11,400	9,600	6,900	3,600	2,400	900	900	600	700	400	500	400	500	500	600	600	800	800	2,500	4,200	7,300	9,700	11,300	12,500
4	13,800	11,600	10,500	9,000	7,500	5,600	3,700	2,100	1,900	1,100	1,100	800	900	800	1,400	1,400	2,900	4,500	7,000	8,300	9,400	10,700	11,600	12,600
8	13,300	12,100	11,000	10,100	8,900	7,900	6,800	5,400	4,000	2,400	2,400	1,500	1,800	1,600	2,900	3,700	5,700	6,900	7,900	8,900	9,700	10,800	11,600	12,400
12	13,000	12,000	11,000	10,300	9,300	8,600	7,800	7,000	6,300	5,100	4,400	3,300	3,400	3,900	5,000	5,900	6,900	7,600	8,400	9,200	9,900	10,800	11,400	12,200
16	12,900	11,900	11,100	10,400	9,500	8,900	8,100	7,400	6,600	5,200	4,500	3,200	3,500	3,700	5,000	6,000	7,100	7,900	8,800	9,500	9,100	9,900	10,500	11,000
20	11,500	10,700	10,100	9,500	8,800	8,300	7,700	7,000	6,400	5,500	4,900	3,400	3,600	4,000	5,200	5,900	6,800	7,400	8,000	8,400	9,100	9,800	10,300	10,800
24	11,500	10,700	10,000	9,500	8,900	8,300	7,800	7,200	6,700	5,900	5,400	4,300	4,300	4,900	5,900	6,300	7,000	7,500	8,000	8,600	9,100	9,700	10,300	10,700
52	11,000	10,000	9,500	9,000	8,400	7,900	7,400	6,900	6,500	6,200	6,000	5,800	5,800	5,800	6,100	6,300	6,800	7,200	7,800	8,200	8,600	9,300	9,800	10,200
56	11,000	10,000	9,500	9,100	8,100	7,700	7,100	6,800	6,300	6,400	6,100	5,800	5,900	5,900	6,300	6,400	7,000	7,400	7,900	8,300	8,800	9,300	9,800	10,200
60	10,900	10,000	9,500	9,000	8,400	8,100	7,400	7,100	6,700	6,400	6,200	5,800	5,900	5,900	6,200	6,400	6,900	7,200	7,800	8,200	8,700	9,200	9,600	9,900

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec.

TABLE IV-37. FUEL VAPOR CONCENTRATIONS IN PPM

Test 37 Conditions: Fuel - avgas. Temperature - 76°F. R.H. - 96% Sample Configuration No. 4. Four gallons of avgas in a drip test. 6/14/72.

Time (min)*	Sample Point Numbers 1	2	3	4	5	6	7	8	9	10	11	12
0	4,900	600	400	200	200	200	200	200	200	200	200	200
4	10,000	2,000	1,000	500	500	200	200	200	200	200	200	200
8	9,800	4,500	2,500	1,200	1,000	500	500	200	300	200	200	200
12	10,100	6,000	3,700	2,600	2,000	1,100	900	400	400	300	300	300
16	10,400	7,200	5,100	3,800	3,200	2,300	1,800	1,000	1,000	500	500	300
20	10,700	7,800	6,200	4,800	4,100	3,000	2,500	1,800	1,600	900	900	600
24	10,800	8,100	7,100	5,900	5,100	3,900	3,300	2,400	2,000	1,200	1,200	900
48	11,300	8,900	8,300	7,800	6,900	6,400	6,000	4,600	4,200	3,600	3,300	2,900
72	12,200	9,900	9,300	8,900	8,400	7,800	7,300	6,100	5,500	4,500	4,300	3,700
96	12,600	10,500	10,000	9,600	9,200	8,700	8,200	7,700	7,200	6,700	6,400	6,000
120	12,800	10,800	10,300	10,000	9,700	9,200	8,800	8,300	7,900	7,500	7,300	7,000
144	13,000	10,900	10,000	10,100	9,600	9,100	8,600	8,100	7,700	7,400	7,100	6,900
168	12,900	10,700	10,100	9,700	9,100	8,500	7,900	7,300	6,100	5,900	5,600	5,600
192	13,800	11,700	10,900	10,600	10,000	9,400	8,800	8,[illegible]00	7,600	7,200	7,000	6,600
216	13,900	11,600	10,900	10,600	9,800	9,100	8,500	7,900	7,400	6,900	6,800	6,400
240	13,800	11,900	11,300	10,900	10,500	9,800	9,300	8,800	4,300	7,900	7,600	7,400

Time (min)*	Sample Point Numbers 13	14	15	16	17	18	19	20	21	22	23	24
0	200	200	200	200	200	200	200	200	200	200	1,800	4,300
4	200	200	200	200	200	200	300	300	900	500	2,400	5,100
8	200	200	200	200	300	300	1,000	1,200	2,200	2,900	5,300	8,200
12	300	300	300	200	400	700	1,900	2,300	3,500	4,400	6,600	8,600
16	300	300	400	400	1,300	1,600	2,700	3,400	4,400	5,300	7,400	9,000
20	600	500	900	900	1,900	2,300	3,400	4,300	5,600	6,600	7,700	9,100
24	1,000	1,000	1,500	1,600	2,600	3,100	4,200	5,100	6,400	7,200	8,100	9,600
48	2,100	2,900	3,900	3,800	4,400	5,000	5,500	6,800	7,300	7,400	8,000	9,300
72	3,900	3,900	4,600	5,100	6,800	7,400	8,200	8,600	9,000	9,400	9,900	10,700
96	6,000	6,100	6,600	7,000	7,600	8,000	8,600	9,000	9,500	10,000	10,390	11,100
120	7,000	7,100	7,500	7,800	8,300	8,800	9,300	9,700	10,000	10,400	10,700	11,500
144	6,800	6,900	7,200	7,400	7,700	8,100	8,700	9,100	9,600	10,200	10,600	11,300
168	5,700	5,700	6,100	6,400	7,000	7,600	8,400	8,500	9,200	9,800	10,400	11,100
192	6,600	6,700	7,000	7,200	7,800	8,300	9,000	9,700	10,400	10,900	11,200	12,000
216	6,500	6,400	6,800	6,900	7,500	8,100	8,800	9,500	10,100	10,800	11,300	12,100
240	7,400	7,400	7,800	8,100	8,500	9,000	9,500	10,300	10,600	11,200	11,600	12,300

*The time shown corresponds to Sample Point No. 1. Each sample point beyond No. 1 is spaced 10 sec.

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